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Battelle Technical Review

IN THIS ISSUE: Can We Live in Babel?

New Uses for Titanium Alloys

VIGNETTE

ANALYTICAL CHEMIST

DAN L. CHASE

Atomic energy, electronics, and the demands of aircraft and missiles have, of course, created great challenges for science and technology. Analytical chemistry has also been affected. In fact, declares Dan L. Chase, supervisor of Battelle's analytical chemistry laboratory, meeting those challenges has led to a veritable revolution in his field. Chemists have had to devise methods of handling unusual materials and of identifying almost imperceptible amounts of elements. Improved techniques are frequently being developed or adapted, Dan states, but the analytical chemist is also putting to use a growing arsenal of devices to help solve his problems.

Dan's own experience reflects the radical changes in his chosen field. His early interest was centered in the analysis of steels and of the ores of conventional metals. As the applications of atomic energy multiplied after World War II, his concern shifted also. He and his Battelle colleagues were deeply involved in the study of the ores and concentrates of uranium, thorium, and the rare earths—in preparation for beneficiation and winning. Dan also has pioneered in the development of techniques for analyzing the unusual materials which use of atomic energy requires. More recently, he and his co-workers have been concerned with the evaluation of reactor fuels.

The interest in high-purity materials has added a new facet to Dan's responsibilities. The extreme demands upon metals for use in flight require the most precise knowledge about them. And in electronic usage, the presence of the tiniest traces of impurities can change the electrical properties of materials immensely. Analyses may have to be for one part of impurity in a million or less. This calls for new ultra-sensitive techniques and equipment, such as the spectrophotometer, polarograph, or ion-exchange processes.

A file in Dan's office contains more than 500 analytical techniques, and it suggests the scope of the analyst's task. Ingenious ideas stud the files.

Dan has taken on other obligations. He was recently named to the Committee for the Investigation of Analytical Techniques for Titanium of the Materials Advisory Board of the National Research Council—National Academy of Science. He is also a member of the Niobium Task Force and of the Task Force for Evaluation of Analytical Techniques for Niobium of the American Society for Testing Materials. Dan is an active member of the American Chemical Society.

Before his association with Battelle in 1941, Dan had served as a chemical analyst with the Republic Steel Corporation. Earlier he had received his B.A. degree in chemistry from The Ohio State University.

A baseball player in his college years, Dan now claims to be mainly a critical spectator of several sports. Nevertheless he is reputed to play a good game of golf. He and his wife Grace sometimes slip away from their sons (ages 11, 15, and 17) to see a play. They are, however, more likely to be busy at their church.

BATTELLE TECHNICAL REVIEW

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Abstracts of articles and papers in a wide variety of technological fields from more than 1350 journals published throughout the world. Abstract selection largely reflects primary areas of Battelle research.

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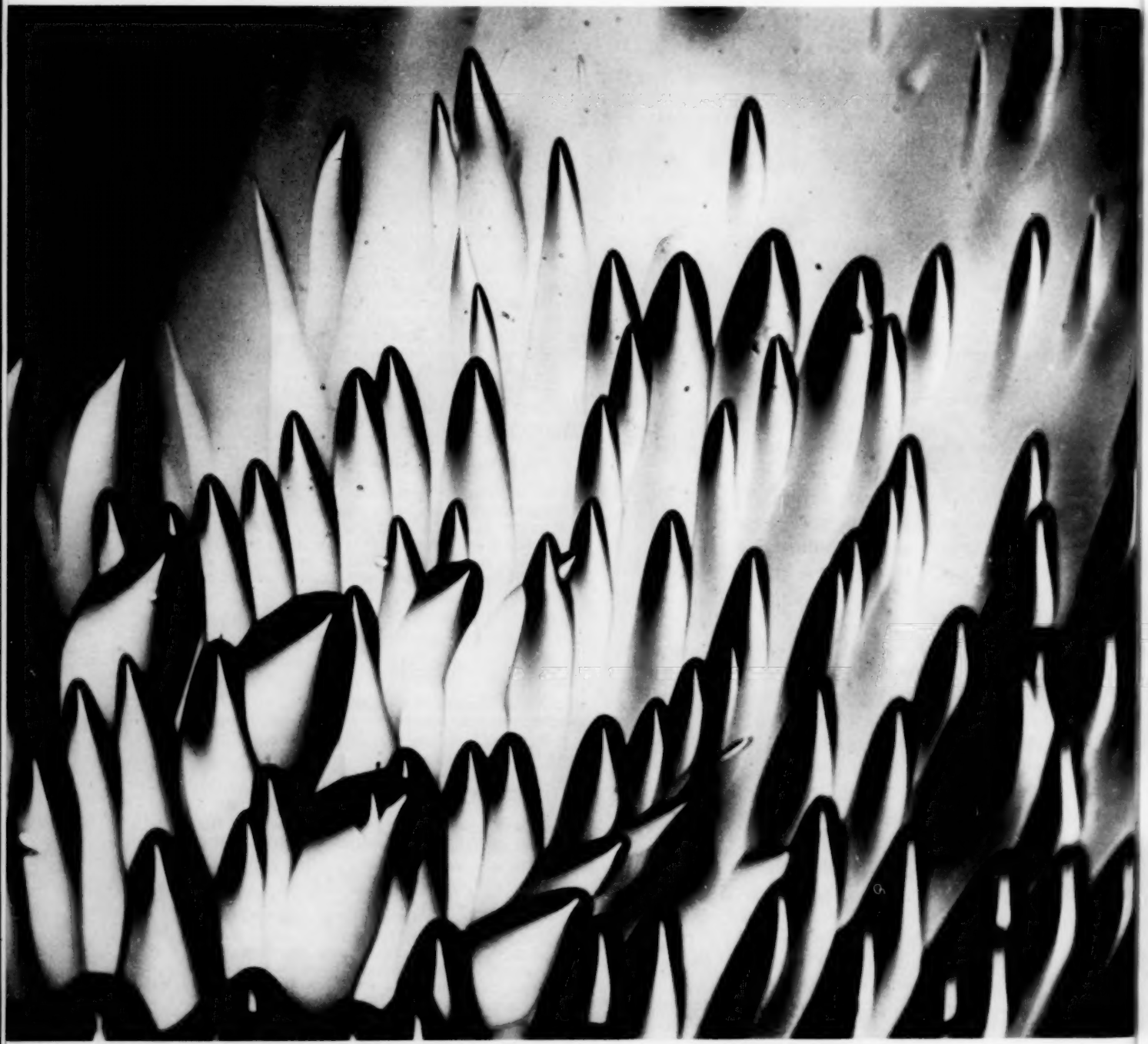
The conical etch pits shown in the photomicrograph (150X) provide important information to technologists who have been studying the electrical properties of indium antimonide. In seeking to learn how the structure of the material affects these properties, indium antimonide single crystals were ground into spheres, then polished and etched before being photographed. The etch pits reveal the presence of defects in the crystal lattice—and, at the same time, they indicate the planes of the crystals on which the defects can be made visible. Properties of indium antimonide are being investigated currently by Battelle technologists A. C. Beer, R. E. Maringer, J. J. Duga, and R. K. Willardson.



DATA FROM CRYSTAL DEFECTS

Lithium, A Promising Alloying Element

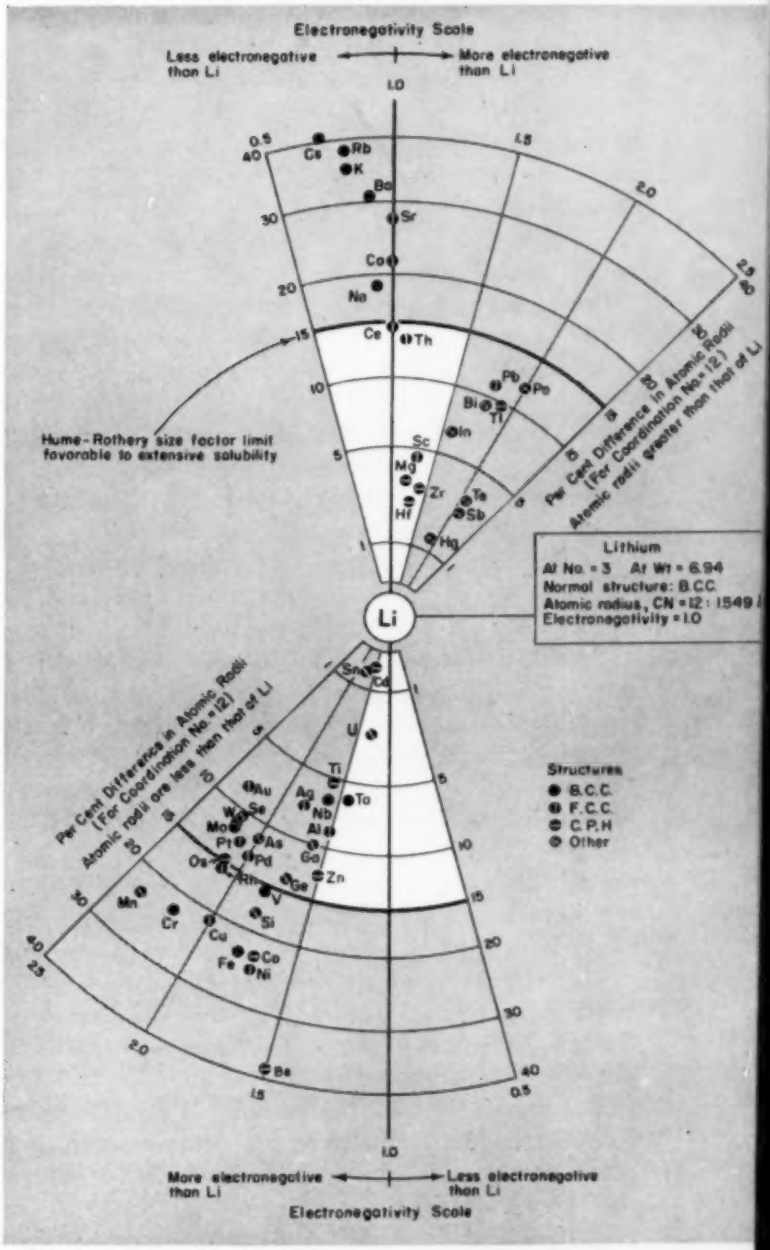
Recent research has shown that lithium, the lightest of all metals, is a promising alloying element. Several recently developed alloys containing lithium appear to have great usefulness for structural and nuclear energy applications. The author believes that, with increased demands for lightweight alloys, new uses for lithium will be found.

by PAUL D. FROST

THE DEMANDS OF OUR TECHNOLOGY are creating rapidly increasing needs for construction materials with unusual properties. In one direction, the need is growing for lightweight materials. Missiles and aircraft, among other structures, call for lightweight metals with strength and resistance to elevated temperatures. In the search for such materials, light-metal alloys have had a pre-eminent place. It followed that lithium, lightest of metals, should be studied in this connection.

In the light of recent research, lithium has turned out to be a highly promising alloying material. Thus, metallurgists have developed a high-strength aluminum alloy that contains lithium. This new alloy's excellent properties are expected to aid the expansion of aluminum's usefulness in the aeronautical field. There are also alloys of magnesium, containing up to 15 per cent lithium, that show promise for special missile and armor applications.

Actually, only a narrow sector of lithium's properties as an alloying element has been studied. As new


Electronegativity Scale
Less electronegative than Li
More electronegative than Li
Hume-Rothery size factor limit favorable to extensive solubility
Per Cent Difference in Atomic Radii (For Coordination No.=12) Atomic radii greater than that of Li
Per Cent Difference in Atomic Radii (For Coordination No.=12) Atomic radii are less than that of Li
Lithium
At No. = 3 At Wt = 6.94
Normal structure: B.C.C.
Atomic radius, CN = 12: 1.549 Å
Electronegativity = 1.0
Li
Structures
B.C.C.
F.C.C.
C.P.H
Other
More electronegative than Li
Less electronegative than Li
Electronegativity Scale

The diagram shows differences between the atomic radii and electronegativities of lithium and other elements. These are primary factors in determining the abilities of elements to alloy. The per cent difference in atomic radii is calculated for lithium as the dissolved element.

aspects of the metal's possible usefulness are recognized, it is likely that more lithium-bearing alloys will be developed for specific applications.

FACTORS IN ALLOYING

In developing an alloy, the metallurgist must consider a number of factors; some are concerned with the chemical and physical properties of the metals, others with their economics. First of all, the metal-

lurgist must consider the characteristics required of the alloy for the particular application. In most instances, strength, modulus of elasticity, ductility, i.e., ability to be deformed without fracturing, resistance to corrosion and elevated-temperature oxidation, and density are very important. Other properties of metals sometimes have to be considered—resistance to wear, ability to be plated, and nuclear properties, such as the ability to absorb neutrons or gamma radiation.

Once the application is known, the metallurgist proceeds with the selection of a basis metal and other metallic elements that can be tailored into an alloy to meet the requirements. In selecting alloying elements he must consider first, their ability to be alloyed and second, their effects on the properties of the alloy. These factors are largely concerned with the solubility of the alloying element in the base metal. Not only must the element be capable of being dissolved in the molten state, but, for most alloys, appreciable solubility in the solid state is required. Some metals, e.g., copper and gold, are completely soluble in one another in the solid state; other metals may have very limited mutual solubility, and these will form a series of intermediate phases. Metal systems which form extensive solid solutions generally produce ductile, workable alloys; those in which intermediate phases (called intermetallic compounds) rather than solid solutions prevail, produce brittle, less useful alloys. Some metals dissolve in others to such a limited extent that they cannot be alloyed.

The extent to which one metal will dissolve in another is governed by several factors. These include the type of crystal structure, relative size of the metal atoms, the valences of the metals, and the relative electronegativities* of the metals. Two metals must have the same crystal structure in order to have complete mutual solid solubility. However, if the sizes of their atoms do not differ by more than about 15 per cent, they can have different crystal structures and still display extensive solid solubility. If the elements have widely different values of electronegativity or different valences, they will be less inclined to dissolve in one another. Metallurgists have discovered that elements having electronegativity values that do not differ by more than approximately ± 0.4 unit tend to dissolve in one another.

The relationships between solubility and the factors of atomic radii, electronegativity, and valence are not strictly quantitative; although they can be used for guidance in the development of alloys, their relationships do not eliminate the need for experimentation.

*A relative numerical rating of the reactivity or tendency of a metal to combine with other elements.

Lithium as an Alloying Element

With these limitations in mind, let us consider the diagram on page 3. This schematic plot shows which metals are likely, and which are unlikely, to alloy with or dissolve lithium. Crystal structures of the various elements are indicated. The atomic radius size factor limit favorable to extensive solubility, ± 15 per cent, is shown in heavy lines. A large number of elements have atomic radii that fall within these limits with respect to lithium and, on the basis of size factor alone, we might expect that many of these elements would dissolve lithium readily. The diagram indicates that lithium would not be soluble in elements of Group I or Group II of the periodic table, except in the case of magnesium. Likewise, lithium would not dissolve extensively in the transition elements chromium, manganese, iron, cobalt, and nickel. Some solubility might be expected, however, in certain other transition elements, e.g., titanium, zirconium, scandium, and hafnium.

Let us next consider electronegativity as a solubility factor. Lithium, a relatively reactive element, has a value of one unit. Most metals are less reactive, or more electronegative. Elements that are plotted within the region bounded by electronegativity values approximately 0.4 unit on either side of 1.0 should have the greatest ability to take lithium into solid solution. In this respect, those elements which appear to be the best solvents for lithium include Group I and II elements plus cerium, thorium, scandium, zirconium, hafnium, cadmium, uranium, tantalum, aluminum, zinc, and beryllium.

Considering both the atomic size factor and the electronegativity factor, the white portion of the plot contains those elements which appear most likely to

Paul Frost has conducted and directed research on a lengthy list of metals problems, particularly of the light metals. Included in his Battelle responsibilities have been research programs on titanium, aluminum, copper, magnesium, zirconium, and tantalum in addition to lithium. He has been associated with research leading to successful heat-treating practice for titanium and zirconium and to the first successful extrusions of titanium. Author of numerous papers, he received the 1957 Metal Treating Institute Achievement Award for his paper on heat treating of titanium.

dissolve lithium in the solid state. Information is not available on the solubility of lithium in cerium, thorium, scandium, zirconium, hafnium, uranium, or tantalum. The zinc-lithium system is characterized by intermetallic compounds and very limited terminal solid-solution ranges. However, the magnesium-lithium, aluminum-lithium, and cadmium-lithium systems have fairly extensive solid solubility limits compared with other lithium systems. It is interesting that silver, which actually is capable of holding a large quantity of lithium in solid solution, is well outside the favorable zone according to the value of electronegativity here assigned to silver. It can be shown that by using a different method for calculating the electronegativity of silver, this element, also, would be in the white zone.

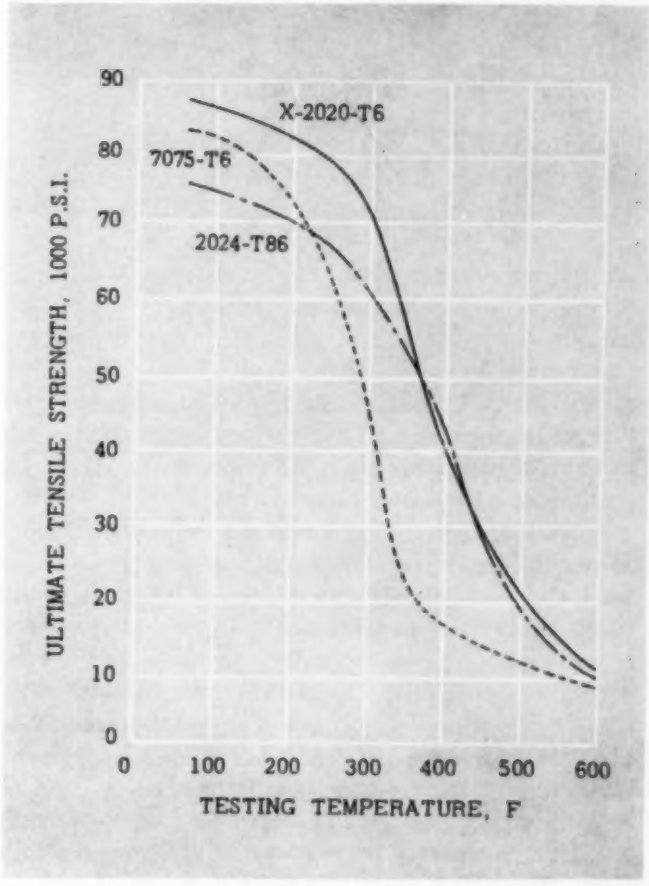
The large differences between the melting temperatures of lithium and several of the elements in the white area, e.g., zirconium, hafium, and thorium, lead one to believe that these elements would not dissolve much lithium, if any. In the course of a titanium alloy development program at Battelle it was found that a small amount of lithium could be retained in a titanium ingot. It would be interesting to investigate this further and to examine the other elements which appear from the schematic plot to have some possibility of dissolving lithium.

Other Factors Affecting Lithium's Future

The low melting point, high chemical reactivity, and low strength of lithium probably preclude any possibility that it will be used in the unalloyed condition as a structural material except for very specialized purposes. As an alloying element, however, it contributes markedly to the strength and certain other properties of several metals. The greatest incentive for using lithium in alloys is its extremely low density (0.53 gm/cm^3).

A very important factor in considering lithium as an alloying element is its chemical reactivity. Although more reactive than magnesium, lithium is less reactive than sodium, potassium, or calcium. Under certain conditions lithium may actually produce increased corrosion resistance in an alloy. However, in general, lithium alloys will probably have to receive more corrosion protection than the common structural alloys of aluminium, magnesium, and steel. Likewise, the chemical reactivity of lithium makes alloying and melting procedures more difficult, although adequate procedures are now known.

Certainly the cost of lithium is an important consideration in anticipating future uses. Here, as with most metals, cost is a function of demand. There is no doubt that the present prices of lithium can be reduced as more of it is used in alloys and other applications. Moreover, there appear to be enough lithium ore deposits to supply all needs for many years in the future.



The ultimate tensile strength at temperatures to 600 F of a new aluminum-lithium structural alloy (X-2020-T6) and two familiar aluminum alloys. (Data courtesy of Aluminum Company of America).

Considerations of solubility, cost, availability, strength, and other factors suggest that the most important lithium alloys of the future will be made from magnesium and aluminum. The large solubility of lithium in silver could lead to useful alloys for applications in which cost is a secondary consideration.

Applications of Lithium in Alloys

Several important uses of lithium prior to World War II were in a high-strength aluminum alloy, Scleron, in a lead-bearing alloy, B-metal, and as a scavenger in copper. Although important, these applications used very little lithium.

Scleron, an alloy reported to have strength comparable with that of the copper-hardened duralumin series of aluminum alloys, contained about 12 per cent

zinc, 2 per cent copper, 0.5 per cent manganese, and 0.1 per cent lithium. The alloy was developed and used in Germany during World War I, but it is no longer used.

The lead-lithium bearing alloys were developed early in Germany, apparently out of a necessity to find a substitute for alloys containing tin. Lithium is only slightly soluble in lead and small additions effect considerable hardening. The bearing alloy B-Metal contained about 0.04 per cent lithium, 0.73 per cent calcium, 0.66 per cent sodium, 0.03 per cent potassium, under 0.2 per cent aluminum, balance lead. Since the early German developments, other alloys of lead with lithium have been used for various applications such as cable sheaths and storage battery grids. None has required any extensive use of lithium.

A number of references exist on the use of lithium as a deoxidizer, principally in gray iron, low-carbon steel, and in copper. There is some question as to the practicability of using lithium in ferrous alloys. Magnesium, which is less expensive, is commonly used for producing nodular iron, a ductile cast iron, but lithium is not used at the present time. The use of lithium as a deoxidizer for copper is practiced, but not extensively.

A promising use for lithium is as a component of brazing alloys, particularly those used for steel and titanium. In the past several years, much research has been conducted on silver-lithium brazing alloys at Armour Research Foundation. Alloys of silver with one or two per cent lithium have been found to produce sound bonds between bars of Type 303 stainless steel when brazing is carried out under an atmosphere of either pure nitrogen or 90 per cent N_2 — 10 per cent H_2. The lithium in the brazing alloy makes it possible to braze in the absence of a flux. A number of commercial brazing alloys that contain lithium are now available. The use of the metal in brazing alloys represents an application of major importance as compared with the use of lithium in the past.

Lithium Nuclear-Energy Applications

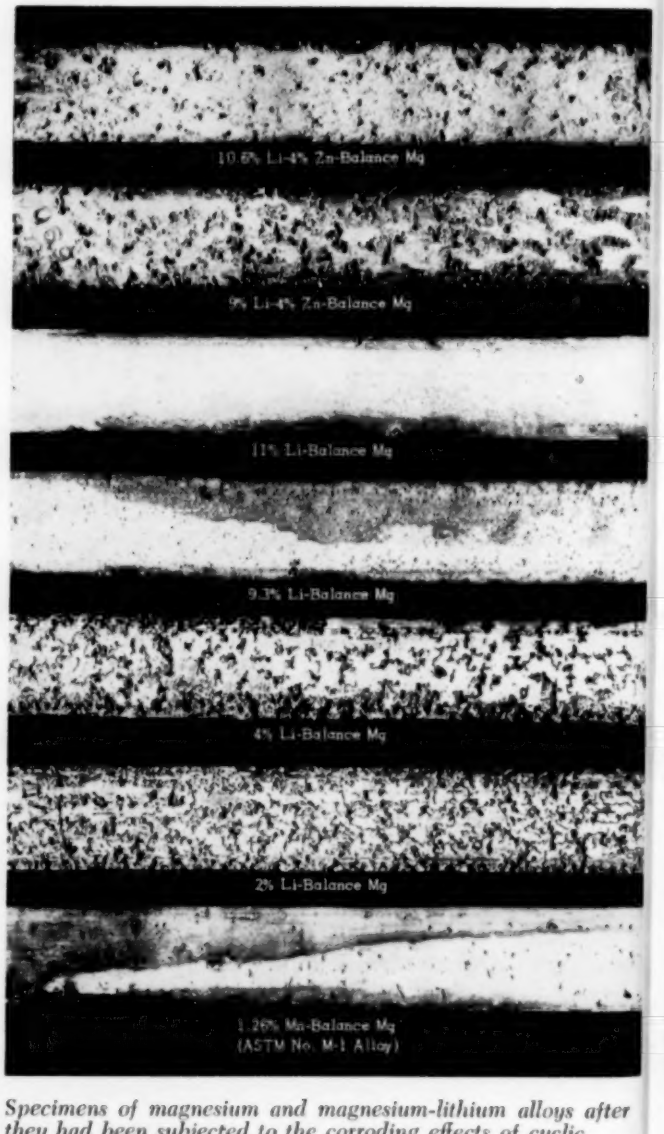
Perhaps the most promising use that can be visualized for lithium alloys is in connection with nuclear reactors, as a shielding material for absorbing neutrons and as an agent for the production of tritium. The extent to which lithium may be used in the future is not known. However, it is known that tritium, or heavy hydrogen, a nuclear fuel useful for generating energy by atomic fusion, can be made by the bombardment of the lower-mass isotope of lithium with neutrons.

$$_3Li^6 + {}_0n^1 \rightarrow {}_1H^3 + {}_2He^4$$

Natural lithium (atomic weight is 6.94) is composed of approximately 7.5 per cent Li^6 and the rest Li^7. Information concerning the use of lithium for this purpose is classified.

Information on the application of lithium as a shielding material for thermal neutrons is not generally available. On a weight basis lithium is one of the most effective neutron absorbers; cadmium and boron are the only common elements that surpass lithium in this respect. Unfortunately lithium is not an effective shield for gamma radiation; at the same time, unlike boron, lithium does not generate dangerous secondary gamma radiation when bombarded by neutrons. Possible use of light alloys of lithium in the shielding of airborne nuclear reactors is conceivable.

Lithium is being used in a lead alloy developed at Oak Ridge National Laboratory to shield instruments



Specimens of magnesium and magnesium-lithium alloys after they had been subjected to the corroding effects of cyclic immersion in a three per cent NaCl solution. The corrosion resistance of the lithium-containing alloy third from the top is especially noteworthy.

from thermal neutrons and gamma radiation. An alloy of 0.69 weight per cent lithium, balance lead, approximately the eutectic composition, is being used. The purpose of lithium is to provide the protection against neutrons, the lead being the gamma shield. Mechanical properties of the alloy at room temperature compare with pure lead as follows:

	Pure Lead	Alloy
Tensile strength, psi	1433	7654
Elongation in 2 inches	33	22

Castings of the alloy weighing up to 20,000 pounds have been reported*

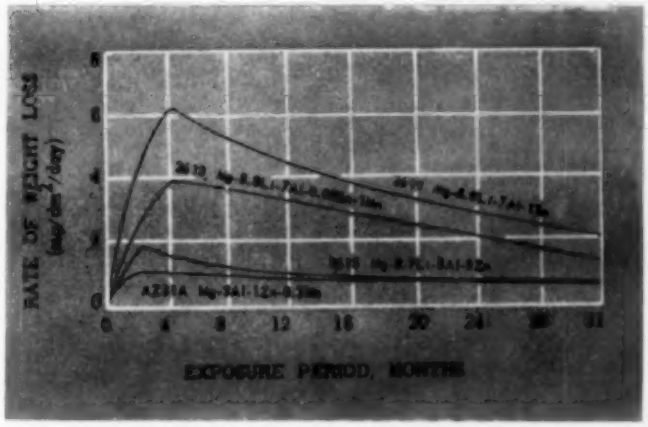
A New Aluminum-Lithium Alloy

A number of patents have been issued on aluminum-base alloys containing lithium as a strengthening agent. Until recently, however, no aluminum-lithium alloy other than Scleron had been produced for industry. Within the last year the Aluminum Company of America has made available, in experimental quantities, a new aluminum alloy (designated X-2020-T6) in which 1.0 per cent lithium is the most important alloying addition. The other principal hardening element is copper, present in an amount of about 4.0 per cent.

The alloy is being evaluated at the present time by a number of aircraft companies. Interest in the alloy is high because it has better strength, particularly at elevated temperatures, a higher modulus of elasticity, and lower density than the strongest aluminum alloys currently produced. The strength properties of the new alloy and of two familiar structural aluminum alloys are compared in the graph on page 5. The tensile strength of X-2020-T6 surpasses that of the other alloys at room temperature and up to about 350 F. It is considerably stronger than 7075-T6 at temperatures above 200 F, however, the new alloy has less ductility than 7075. At the same time, the formability of the alloy is equivalent to or better than that of the other two alloys. Studies also show that the new alloy has superior rupture strength at temperatures up to 400 F.

Like other high-strength aluminum alloys, X-2020 is a heat-treatable material and attains its highest strength by a solution and age-hardening cycle. Unlike 2024, the new alloy age hardens very slowly at room temperature; after one week following the solution treatment, the tensile strength increases only about 5000 psi. This is a great advantage because sheets of the alloy may be solution treated and subsequently formed in the soft condition at any time. In the case of 2024 refrigeration is necessary to prevent age hardening during the period between the solution treatment of the sheet and the forming of parts from the sheet.

*Private communication from R. R. Studer, Brooks & Perkins, Inc.



The corrosion effects of exposure to salt air on three magnesium-lithium alloys and a magnesium alloy with no lithium.

Limited corrosion tests indicate the new alloy has corrosion resistance similar to that of 2024 alloy. Although it is not yet available, it has been shown that X-2020 sheet can be clad if there is a need for an aluminum-clad product.

The new alloy promises to be important to aircraft and missile designers by permitting the design of structures having greater stiffness and ability to operate at higher temperatures than currently possible, with a minimum weight penalty.

Magnesium-Lithium Alloys

Alloys of magnesium and lithium may, in the future, consume more lithium than any other application visualized at this time. Alloys containing up to 10 or 15 per cent lithium are being investigated for possible use in aircraft, missiles, and other applications. Lithium is the only element capable of converting the hexagonal lattice structure of magnesium to the more ductile body-centered-cubic structure. Lithium in magnesium not only improves the latter's ductility but markedly lowers its density.

Research conducted at the Mathieson Alkali Works and at Battelle over a period of about 12 years has had as its objective the development of magnesium-lithium base alloys with good ductility and high strength. Fluxes and procedures for melting the alloys were developed in this research, and the mechanical properties, corrosion behavior, and age hardening behavior of a great many alloys were studied. The most important contributions of the early research and of subsequent investigations are reviewed below.

Investigations have shown that the hexagonal-phase alloys of magnesium and lithium are more ductile and more readily cold worked than unalloyed magnesium, but they are not so ductile as the alpha-beta alloys. The most ductile are the all-beta alloys which contain 10.3 per cent or more lithium.

The binary alloys, although ductile, are weak. They can be strengthened by additions of aluminum, zinc, cadmium, silver, mercury, thallium, indium, or gold, which are the most soluble elements. Alloys containing at least 8 per cent lithium and a sufficient addition of certain of the elements just named, can be solution heat treated, quenched, and aged to produce exceptionally high strength (up to about 60,000 psi).

These alloys tend to lose strength at temperatures only slightly above room temperature—a problem that has prevented the commercial use of magnesium-lithium alloys. Although the reason for the instability of the high-strength alloys is understood, no way of overcoming it has been evolved to date. Despite this, there appears to be a good possibility that magnesium-lithium alloys will find uses in military applications in the future. A project has been initiated at Battelle to investigate the feasibility of using the alloys in rocket applications. Such use is a possibility because in some applications, strength at elevated temperatures may be required for short periods of time rather than for indefinite periods, as is the case in conventional aircraft. Furthermore, in rockets low weight is as important as strength. Another application for the lower-strength magnesium-lithium alloys being studied at the present time is protective armor for aircraft and military ground vehicles.

In any application, corrosion resistance must be considered. In general, the corrosion resistance of alloys containing over 10 per cent lithium might be expected to be poor. This is particularly true of those alloys which contain heavy elements for hardening purposes. However, the corrosion resistance of the 11 per cent lithium binary alloy has been shown to compare favorably with a commercial magnesium alloy. The specimens on page 6 illustrate the effects of cyclic immersion in salt solution on the appearance of several magnesium-lithium alloys and commercial M1, a magnesium-manganese alloy. The best resistance to corrosion was displayed by the 11 per cent lithium binary, third specimen from the top.

The graph on page 7 shows the results of some salt-air exposure tests at Daytona Beach, Florida, on magnesium-lithium alloys. One alloy, which contained Mg-9% Li-5% Al-8% Zn had corrosion resistance approximately equivalent to that of commercial AZ31A magnesium. The other two alloys had relatively poor corrosion resistance. This example demonstrates effectively that the reactive nature of lithium need not preclude it from use in alloys if the proper selection of alloying elements is made.

Obviously more studies are required to tailor lithium alloys for specific applications in order to achieve the desired results. It would appear, however, that if sufficient incentive is provided, such as the current need to reduce weight in aircraft, new applications for lithium will arise.

CONSERVATION OF INTELLECTUAL RESOURCES

"We probably need to fear not the exhaustion of physical resources, but the dangers of inadequate or belated utilization of our intellectual resources. I hope we are currently rediscovering the need to practice this kind of conservation.

"Wider recognition of the part that science and technology have played in the conversion of conservation from a movement based on fear to one calling for wise use of presently used resources and the preservation of social and esthetic values may well stimulate research by the social scientists to seek comparable progress toward the newer objectives."

Thomas B. Nolan,
Director of U.S. Geological Survey

CAN WE LIVE IN BABEL?

*some thoughts on weights and measures**

by RALPH A. SHERMAN

There are those unhappy with the "Babel" of two systems of weights and measures, who urge adoption of the metric alone. The author agrees the step would be desirable. But, he points out with wit and perspective, such adoption would not guarantee a single system. With proper care, he says, we should be able to continue to live with the double system without undue hardship.

THE TITLE OF THIS DISCUSSION is rather obviously poorly chosen. The answer to the question, "Can We Live in Babel?" is well known. We do live, we have lived for many years, and we shall doubtless continue for many more years to live in Babel. If one must ask a question, a better one probably is, "How Can We Live in Babel?"

Many speakers in this Symposium have described the confusion and even chaos that result from the use in different countries, or even in the same country, of different systems of weights and measures. They have extolled the merits of the metric system and have described the advantages to science and industry that its adoption in various parts of the world has brought about. If the proper Representatives and Senators were present, they might be so persuaded that the 86th Congress would enact legislation that would make the metric system obligatory instead of merely permissive in the United States and its possessions.

Because of the ample support that others are giving in this meeting to the thesis that a uniform system of weights and measures should be adopted and used universally, a thesis with which I fully agree, I need not try to present new evidence in support of it. I could recite the difficulties that would arise while the butcher and the grocer got new scales, while the road maps and road signs were being changed, while cookbooks were being rewritten, and while the multitude of other changes necessary were being made. However, other countries have made the change. We should not admit that we could not do likewise.

COMPLETE STANDARDIZATION UNLIKELY

Rather, the purpose of this discussion is to point out that a *complete* standardization of weights and measures is likely never to be accomplished in this country, certainly no more so than has happened in other countries.

France has used the metric system for over 150 years, Germany for about 90. I have not delved deeply into the history of the adoption of the system by these countries. Hence, I cannot recite the exact reasons why

*Presented before the Symposium on Standards of Weights and Measures of Section M (Engineering) of the Annual Meeting of the American Association for the Advancement of Science in Washington, D. C., December 29-30, 1958.

each adopted the system. For France, I would hazard a guess that the logic of the metric system appealed to the logical French mind. As for Germany, the reasons are more apparent. The changeover was made at the time the German Empire was established. The units for measurement of length in Germany had been the Zoll and the Fuss, the inch and the foot. However, the length of the Fuss varied; in the Grand Duchy of Hesse it was only 250 mm long, in Prussia, 313.8 mm, in Bavaria 288.8, and even in Munich, the capital of Bavaria, it had yet another value, 291.8 mm. The Pfund varied from a weight of 476 grams in Prussia to 560 grams in Bavaria, whereas the official German Customs Union weight was 500 grams. For practical commercial reasons, and because it was another means of bringing unity in the Empire, the founders decided on a uniform scale of weights and measures. Possessed also of logic, the Germans adopted the logical metric system.

Somewhat earlier, in 1866, our Congress legalized the metric system of weights and measures and made its use permissive in the United States.

Despite the long history of European use of the metric system, remnants of the inch and the pound still remain on the Continent. One is just as likely in Germany or France to buy butter or meat by the Pfund or the livre, that is by the pound, as by the kilo. However, the Pfund or the livre will not be that of 453.6 grams, but that of 500 grams, a half of a kilo.

Industrially, the Germans in their Pferdestärke and the French in their cheval-vapeur adopted the English term "horsepower", although this metric unit equals only 0.986 HP. Horses are a trifle smaller on the Continent.

Inconsistencies in Europe

If an American or Briton wishes to take a bicycle or motorcycle tour on the Continent, he need not bother to take along spare drive chain for, in Europe, all roller chain, including industrial chain, is dimensioned in inches both in pitch and in width. If he prefers to make the tour in his own car, there need be no fear of difficulty in buying tires. Until rather recently, tires were made only in inch dimensions although now they are made in both inch and millimeter sizes in both Germany and France. I understand that the inch sizes of tires are a DIN Standard in Germany.

Should the tourist wish to do a bit of hunting, he may take his 10, 12, or 20-gage shotgun with assurance that he can get shells to fit. The gage of shotguns is universally expressed as the number of spheres of the diameter of the bore that can be cast from a pound of lead. As Paul S. Foster says, "This happy circumstance is the result of the English Gun Barrel Proof Act of 1868 whereby the London Gunmakers Company and the Guardians of the Birmingham Proof House established dimensional and ballistic standards that have remained in force to this day."*

Finally, the American tourist off for the Continent could even include in his luggage his kitchen sink, because pipe sizes for plumbing are in inch dimensions, and the threads are the same as those back home.

Anomalies in U. S. Practice

A diligent search might uncover as many anomalies in United States practice and a few have come to my attention. The bore and stroke of automotive engines are expressed in inches but spark plugs come now almost entirely in millimeter dimensions. Most antifriction bearings are sized in millimeters. Stone is sold by the perch, a unit of volume, but this volume may vary from 16½ to 25 cubic feet depending on the part of the country where the stone is bought. As a matter of fact, the merchant from whom you buy stone, although he quotes the price by the perch, will probably not know the volume of a perch. He will load a certain weight upon the delivery truck.

On the whole though, we have less chaos in units of measurement in the United States than has existed and does exist elsewhere. To 170 million people in 49 states, a pound is a pound, an inch is an inch, and a fifth is 25.6 fluid ounces. It is true that chemists and physicists prefer to use the metric system and degrees

*Private communication from Paul S. Foster, Superintendent, Ammunition Quality Control, Winchester-Western Division, Olin Mathieson Chemical Corporation.

The author has a long and distinguished record of contributions to research. Since joining the Institute staff in 1930, Ralph Sherman has conducted numerous studies of conventional and unconventional sources of energy and has been responsible for the direction of major research programs in energy utilization and mechanical engineering. In 1948, he received the Percy Nicholls Award of the American Society of Mechanical Engineers and the American Institute of Mining, Metallurgical and Petroleum Engineers. During World War II years he served as a member of the National Fuel Efficiency Council. Much of his work is reflected in the more than 100 papers and articles that bear his name.

centigrade whereas engineers use pounds, feet, and degrees Fahrenheit. Difficulties come to those who are forced to use the two systems from time to time. However, conversion tables are always at hand, and the common conversion factors can become a part of the general knowledge of one who must use them frequently.

Let us not forget that an American may be completely baffled when a man from the United Kingdom says that he weighs 14 stone, but the United Kingdom man is just as confused when the American says that he weighs 196 pounds. The monetary system of pounds, shillings, and pence may appear to a Frenchman, a German, or an American as no system at all. However, an Englishman appears to have no difficulty in computing the proper tip as a percentage of his restaurant check.

After all, weights and measures are a form of language. One who struggles to acquire a speaking facility in a language other than his own is usually amazed to hear a child of three speaking the language better than he who has studied and practiced for five to ten years. We can all agree that one language for all the peoples of the world would be a great forward step. Undoubtedly the Russians wish that Europe and America had at least adopted the Cyrillic alphabet instead of that strange-looking Latin alphabet. Although English gives promise of becoming the second language of those for whom it is not their native tongue, we must reconcile ourselves to the fact that a universal language is an unlikely dream.

A universal system of weights and measures, on the other hand, has much more of a chance of actuality. Although anomalies would undoubtedly still exist, the accomplishment would be a great advance. Until the universal system does come to pass, let us not be too impatient. Let us learn a bit about conversion and let us use care to convert our own values to the language of those we are addressing. If an engineer writes for an audience of chemists, it is well for him to put his values in both the English and metric systems. If an American writes for a European audience, let him use only the metric system. Above all, let us not use hybrid units such as grams/cubic foot, Btu/square meter, or kilogram calories/pound.

I conclude as I began. We do live in Babel; to some extent we shall always live in Babel. However, with some care and with some respect for the habitudes of others we can live in Babel without undue hardship.

INVENTIONS ENCOURAGE INVENTION

"There is a school of thought which believes that every invention makes further invention more difficult and less likely, and thereby narrows progressively the chances of the individual to originate more inventions. . . .

"It is a more realistic hypothesis to suppose that each new invention multiplies the possible combinations of existing ideas and thereby widens the scope for originality. A new invention may at one stroke give fresh value to older ideas up to then unutilized because of some unsurmountable obstacle. A vast accumulation of imperfect ideas is always lying dormant, lacking only some element which can bring them to life."

John Jewkes, David Sawers, and Richard Stillerman, in *The Sources of Invention*, p. 122.

NOTES from BATTELLE

* ELECTRIC REDUCTION OF IRON

Under what circumstances, present and future, will electric furnaces be used to smelt iron ore in the United States? Twenty electric utility, steel, and furnace equipment manufacturing companies are jointly sponsoring an eight-month technical-economic study at Battelle to find answers.

The study will have the following objectives: (1) To evaluate the present position and probable future status of processes for the electric smelting of iron ore in the United States; (2) To determine the conditions under which electric-smelting processes can be used profitably in the United States for the manufacture of pig iron, cast iron, and/or steel; (3) To determine the relative advantages of the blast-furnace process and the electric-furnace process for potential users with different interests; and (4) To develop and analyze information which is needed in planning for expansion, market development, and research programs.

"The technical feasibility of a number of the so-called 'direct reduction' processes using electric furnaces has already been established", according to Battelle technologists Raymond W. Hale and Naaman H. Keyser. "We know that, with these processes, it is possible to produce pig iron directly from iron ore. The question still remains however, whether iron users would be better off using iron produced by the conventional blast-furnace process or by one of the electric furnace direct-reduction processes. We hope to weigh the advantages of these alternatives in a number of situations."

Hale, an economist, and Keyser, a metallurgist, indicated that there are several barriers to the wider acceptance of electric-smelting processes, but this situation appears to be changing rapidly. Continuation of recent trends, they predicted, will make electric smelting competitive with blast furnaces in an increasing number of situations.

"The cost of producing pig iron by electric direct-reduction processes", they said, "is generally higher than the cost of producing pig iron in a blast furnace, but there appear to be some situations today where the costs by the two methods are closely competitive. Generally, these situations will be those which involve conditions favorable to the use of electric furnaces. Such conditions include: low-cost electrical energy; good availability of low-cost coal or fuel gas; poor availability or high cost of metallurgical coke; relatively low desired capacities—roughly 100 to 400 tons of iron per day; and a need for a relatively small capital investment per ton of capacity."

Companies that have, thus far, joined in the sponsorship of the new electric-furnace study include: Acme Steel Company; Alan Wood Steel Company; Armco Steel Corporation; The Cincinnati Gas and Electric Company; The Cleveland Electric Illuminating Company; Copperweld Steel Company; The Detroit Edison Company; Granite City Steel Company; Great Lakes Carbon Corporation; Houston Lighting and Power Company; Illinois Power Company; Interlake Iron Corporation; Kaiser Steel Corporation; Keystone Steel and Wire Company; Laclede Steel Company; Lukens Steel Company; National Carbon Company, Division of Union Carbide Corporation; Ohio Edison Company; Philadelphia Electric Company; Pittsburgh Steel Company; Sharon Steel Corporation; Swindell-Dressler Corporation; Union Electric Company; and West Penn Power Company.

The Battelle study will require the joint efforts of a team of technical economists headed by David D. Moore and a team of process metallurgy research scientists headed by Harold W. Lownie. This group includes several men who participated in a somewhat similar major survey conducted by Battelle in 1952. The earlier survey resulted in the publication of a widely read report on the "Comparative Economics of Open-Hearth and Electric Furnaces for Production of Low-Carbon Steels". Metallurgists contributing to the present study have conducted research ranging from laboratory to pilot-plant work on a number of electric-furnace reduction processes.

* ZINC DIE CASTING FINISHES

Two new plating systems, which markedly improve the corrosion performance of electroplated zinc die castings, are in use for plating some automotive hardware parts. The research leading to the developments was sponsored by the American Zinc Institute, according to William H. Safranek, Bat-

telle specialist in electroplating processes. He described the development and other research being conducted for AZI at Battelle in a recent talk before the Grand Rapids, Michigan branches of the American Electroplaters Society and the Society of Die Cast Engineers.

In the first system, a composite copper-nickel-chromium system, chromium as thin as 0.000025 inch is deposited in a crack-free and pore-free coating. This plate is applied over the customary thickness of copper and nickel. This composite plate provides "excellent" protection against corrosion.

"Accelerated corrosion and outdoor weathering data indicate a two- to three-fold increase in the corrosion protective value of composite copper-nickel-chromium electroplates as a result of a slight increase in the thickness of the chromium combined with appropriate control of the plating conditions", Safranek reported.

The second plating system described is the duplex nickel system. This consists of two layers of nickel electrodeposited in different baths. Conditions for plating the first, thicker layer are adjusted to deposit nickel that is relatively passive to corrosive environments. The outer layer is plated under conditions for depositing bright nickel that requires no buffing. Such nickel is more active chemically than dull or semi-bright nickel plate. Investigations show, however, that the duplex system furnishes much more corrosion protection than an equal thickness of a single bright nickel layer, according to Safranek.

The Battelle specialist also described research now under way at the Institute for improving finishing processes. Included in this research is the development of a process for electropolishing zinc die castings and a process for plating zinc with excellent leveling power. Completion of these developments, he said, would open up possibilities for eliminating the buffing operation that currently is necessary before plating with copper, nickel, and chromium.

One further procedure being studied at Battelle is a direct nickel-plating process that might eliminate the waste-disposal problem currently facing the electroplating industry.

* RARE-EARTH-OXIDE CATHODES

Interest is growing in the possible use of rare-earth oxides as cathodes in high-voltage, pulsed tubes. The conventional barium-strontium oxide cathode has proved most efficient in tubes that operate at lower voltages; but at higher voltages, as used in magnetrons, cathodes constructed of barium-strontium oxide mixtures tend to tear and spark.

Recent studies have revealed much about the electron-emission characteristics of oxides of most of the 4-f series of rare-earth elements. Gordon B. Gaines, Battelle physicist, recently reported on available data in this field. He states that several of the oxides and specific mixtures of oxides show promise as emitters; they are reported to give up to several amperes per square centimeter at temperatures of about 1400 C. Some of their properties, such as high resistance to sparking, also point to possible usefulness in high-voltage devices. Among the promising materials are gadolinium, dysprosium, yttrium (not a "rare earth"), and neodymium oxides. However, Gaines believes that mixtures of two or more oxides are probably more promising.

Much knowledge on the properties of rare-earth-oxide cathodes is still needed. Little is known about such important matters as the seat of the emission and the nature of the emitting surface. The Institute physicist concludes that much more will be learned as methods for purifying the rare earths are improved.

* Last month, Dr. Roger Adams, a member of Battelle's Board of Trustees, was presented The American Chemical Society's Charles Lathrop Parsons Award for outstanding public service. With the award, which is offered only every third year, goes the privilege of selecting a candidate for a graduate fellowship paid for by the Society.

* Recent appointments of Battelle staff members to key technical posts include: *R. F. Dickerson*, member, Steering Committee, Atomic Energy Commission Metallographical Group; *William Drozda*, officer, College of Simulation of the Institute of Management Sciences; *Iver Igelsrud*, editor, "Chemical Literature", American Chemical Society; *J. Harry Jackson*, vice-chairman, executive committee, Institute of Metals Division, Metallurgical Society of the American Institute of Mining, Metallurgical, and Petroleum Engineers; *A. C. Richardson*, chairman, Pyrometallurgical Committee, Extractive Metallurgy Division, American Institute of Mining, Metallurgical and Petroleum Engineers.

Writings by STAFF Members

Welding Journal, v. 37, November, 1958, contains the following articles by staff members:

Effects of Chemical Composition on Cracking Resistance of High-Strength-Steel Weld Metals. R. P. Sopher, pp. 481s-492s.

A study was made to determine the effects of carbon, sulfur, phosphorus, and rare-earths metals on the cracking resistance of high-strength steel weld metals. Experimental equipment was designed and built to determine the strength and ductility properties of the high-strength steel under conditions that simulate the cooling of a weld deposit. The properties were obtained during rapid cooling from the liquid state. The results show that phosphorus, although within the specification limits of aircraft-quality steels, is responsible for low ductility and cracking of welds at temperatures near the solidus.

Development of Methods for End Capping PWR Fuel Elements. Julius J. Vagi and David C. Martin, pp. 499s-506s.

Satisfactory bonds are produced using a medium-capacity spot-welding machine for resistance-upset welding under vacuum, but corrosion behavior of joints is not consistently acceptable.

U. S. Research Reactor Operation and Use. Joel W. Chastain, Jr., editor. Addison-Wesley Publishing Co., Reading, Mass., 366 pp., 1958.

Describes the various types of reactors, their characteristics, operating problems (administrative and legal as well as technical), safety considerations, and costs. Some reactor theory is included to provide the reactor user with a few basic concepts and an understanding of some common terms.

Uranium Ore Processing. John W. Clegg and Dennis D. Foley, editors. Addison-Wesley Publishing Co., Reading, Mass., 436 pp., 1958.

The technology of winning uranium from its ores is described, starting with occurrence and sources, exploration and mining, sampling, analysis, and mineralogy of the ore. Covers preliminary treatments, leaching, separation of leach liquor, and recovery of the uranium product from solution. Typical plants are described and health and safety measures in milling and mining operations are discussed.

Melting and Glass Transitions in Polyisobutylene. R. M. Kell, Bailey Bennett, and P. B. Stickney. *Rubber Chemistry and Technology*, v. 31, no. 3, July-September, 1958, pp. 499-504.

An investigation of the crystallization behavior of uncompounded, unstressed polyisobutylene and butyl rubber. Glass transition data obtained are also reported. The data were determined dilatometrically.

Members of the Battelle staff are authors of the recently published articles and books listed on these pages. In most cases, reprints are available from the Battelle Publications Office, 505 King Avenue, Columbus 1, Ohio.

Investigations of the Adsorption of Water Soluble Organic Compounds on Cotton. I. Adsorption of Amino- or Hydroxyl Substituted Aromatic Compounds. (In German.) **Untersuchungen über die Adsorption wasserlöslicher organischer Verbindungen an Baumwolle. I. Die Adsorption von amino- bzw. hydroxyl-substituierten aromatischen Verbindungen.** D. Lamparsky and E. Rack. *Kolloid-Zeitschrift*, v. 160, no. 1, September, 1958, pp. 7-16.

Purified Egyptian raw cotton was used as sorbent. Adsorption properties of 3-oxyphenyl urea and 3-oxydiphenylamine were studied. Effects of bridge atoms between two benzene rings on the sorption of amino- and oxy-compounds, and effects of structure on the sorption of some hydroxyl or carboxyl substituted diphenyl derivatives were determined.

Producing Martensite by Impact. H. O. McIntire and G. K. Manning. *Metal Progress*, v. 74, no. 5, November, 1958, pp. 94-95.

Sharp blows can produce hard, brittle martensite in hammer heads when edges break off. This martensite, being untempered, is quite brittle and further spalling may occur with little effort. This substantiates the objections of safety engineers to the use of chipped hammers.

Battelle Memorial Institute, Geneva. M. Paquet. *World Science Review*, 1958, November, pp. 3-6.

The development of the research laboratories established in Geneva, Switzerland by the Battelle Memorial Institute was so rapid that by the end of 1958 they had reached the point where the buildings could no longer conveniently house their staff. This is an interesting sign of the acceptance found by contract, or sponsored, research in Europe. Some of the Institute's research facilities and techniques are described.

Improved Electroplated Finishes for Zinc Die Castings. W. H. Safrenek and C. L. Faust, *Plating*, v. 45, October 1958, pp. 1027-1037.

Reports on studies of electropolishing and electroplating procedures for reducing costs of finishing die castings and of plating procedures for improving the corrosion resistance of electroplated die castings.

Pulsations in Single-Port Gas-Fired Residential Heating Equipment. C. F. Speich and A. A. Putnam. *Heating, Piping, and Air Conditioning*, v. 30, November, 1958, pp. 139-146.

Summarizes research conducted on combustion oscillations in gas-fired single-port heating units as part of a four-year program on a fundamental study of pulsations and oscillations in gas- and oil-fired heating equipment. The mechanism of oscillations for single-port gas units was found to consist of a vortex shedding phenomenon at the burner lip coupled with a pressure fluctuation in the heating unit. The natural frequency of the vortex shedding was found to be a function of the average velocity of the combustible gas stream, whereas the frequency of the pressure fluctuations in the heating unit is determined by the resonant frequency of the furnace or boiler. It is the degree of the coupling between these two frequencies when they are together which determines the amplitude of oscillation. Applying the knowledge of the details of the driving mechanism, it is possible to devise more basic means of suppressing oscillations in these units.

Surface Irradiation and Aseptic Muscle Autolysis. I. Biochemical and Structural Autolytic Modifications Occurring in Rabbit, Lamb, and Hog Irradiated and Nonirradiated Fresh Muscles, During Aseptic and Anaerobic Storage in the Dark at 25° and 37° C. II. Food Preservation Combining the Epinephrine Anti-Autolytic Effect With Surface Irradiation. I. R. Zender, C. Lataste-Dorolle, R. A. Collet, P. Rowinski, C. Radouco-Thomas, and R. F. Mouton. **II.** C. Radouco-Thomas, C. Lataste-Dorolle, R. Zender, R. Busset, and R. F. Mouton. Second International Conference on the Peaceful Uses of Atomic Energy, Geneva, September 1958, Paper P/258; 31 pp.; P/258/Add. 1, 32 pp.

Enzymatic autolysis and bacterial spoiling are chiefly responsible for meat deterioration. The combination treatment described in these papers seems to have immediate practical applications in preserving meat without refrigeration.

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ABSTRACTS

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AERONAUTICAL ENGINEERING

1 Transient Temperature and Thermal Stresses in Skin of Hypersonic Vehicle With Variable Boundary Conditions. The transient temperature distribution and thermal stresses resulting from aerodynamic heating in the skin of a vehicle at hypersonic speeds are found analytically. The purpose of this paper is to introduce the concept of using exponential functions of time to represent the coefficient of heat transfer and the adiabatic wall temperature. ***Shih-Yuan Chen.*** *ASME, Transactions,* v. 80, no. 7, Oct. 1958, p. 1389-1394.

2* Atomic Propulsion for Airplanes and Missiles. Recent trends in British research in aeronautics. Motor equipment with gas-cooled reactor and helium-driven gas turbine, supersonic bomber with 25 Mach speed at a 20,000 m altitude; missile with nuclear propulsion. (*In German.*) Atomkraft-Antrieb für Flugzeuge und geschosse. *Aero,* v. 9, Sept. 1958, p. 212-213.

3* The New Exploration. Brings up to date the records of the Russian satellites, and discusses what has already been learned about satellite behavior that contributes towards the ultimate aim of space flight. ***T. R. F. Nonweiler.*** *Aeronautics,* v. 39, no. 2, Oct. 1958, p. 34-37.

4 Convair's Model 600. The way in which the latest Convair aeroplane has evolved from the 880 is a good example of the kind of refinement of turbojet transports which can be expected to appear during the next decade. *Aeroplane,* v. 95, Oct. 3, 1958, p. 517-519.

5 Simple Shielded Total-Pressure Probes. Design features and characteristics of conventional, modified and shielded total-pressure probes are briefly discussed, and compared with new shielded instruments of simple construction which combine smallness of size with adequately fast response to pressure changes. ***F. A. L. Winternitz.*** *Aircraft Engineering,* v. 30, Oct. 1958, p. 313-317.

6* Synchronizing Wing Flap Cylinders. ***E. C. Fox.*** *Applied Hydraulics and Pneumatics,* v. 11, Oct. 1958, p. 116 + 1 page.

7 X-15 Rolls Out; Capability for Mach 7 Is Visualized. North American Aviation's X-15, hypersonic research aircraft will probe the approaches to true manned space flight. ***Irving Stone.*** *Aviation Week,* v. 69, Oct. 20, 1958, p. 26-29.

8 High Strength Steels for Aircraft Applications. While the major use of superalloys at the present time is in the construction of jet engines, it is likely that these alloys will become important as airframe constructional materials in the future, as aircraft are designed to operate at increasingly higher temperatures. ***A. J. Lena and E. E. Reynolds.*** *Blast Furnace and Steel Plant,* v. 46, Oct. 1958, p. 1081 + 8 pages.

9* Some Recent Aids to Aircraft Design. Guided weapons, which are rapidly taking over the major role in the aircraft industry, exemplify the revolution in techniques. Analysis of a complete weapon system comprising propulsion, guidance, control and warhead has exceeded the capacity of manual methods so that recourse to calculating machines has become essential. Also, a protracted period of development has required a comprehensive series of test vehicles designed to establish separate and collective data in a progressive pattern. Special instrumentation and telemetry has been devised to acquire this information. ***A. E. Russell.*** *Canadian Aeronautical Journal,* v. 4, no. 8, Oct. 1958, p. 265-277.

10* The Effect of Icing on Aircraft Equipped With Vortex Generators. By reproducing in plastic the ice formation which has been found to build up on vortex generators tested under heavy icing conditions in a low temperature wind tunnel, it was possible to carry out flight tests to determine the effects of such icing on vortex generator installations on a Harvard and on a CF-100 aircraft. ***A. D. Wood and D. G. Gould.*** *Canadian Aeronautical Journal,* v. 4, no. 8, Oct. 1958, p. 278-280.

11* The Application of Analogue Computers to Guided Missile Design. ***W. S. Kozak.*** *Canadian Aeronautical Journal,* v. 4, no. 8, Oct. 1958, p. 281-288.

12* Study of Circulation Around the Apex Eddies of a Delta Wing in Subsonic Flow. The delta wing was at a nonzero incidence in a uniform current with a speed contained in the plane of symmetry of the wing. The approximate value of circulation agrees with experiemntal datas; yet at a certain distance of the apex the circulation remains constant. (*In French.*) Étude de la circulation autour des tourbillions d'apex d'une aile en delta écoulement subsonique. ***André Papon.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences,* v. 247, no. 7, Aug. 18, 1958, p. 679-682.

13* The Protection of Light Metal Structures in Aeronautical Construction. Protection with pure Al, or Al-zinc coatings. Protection by chemical oxidation or anodic oxidation with chromic or sulfuric acid, etc., or by means of organic coatings applied to the wings and bodies of airplanes. (*In French.*) La protection des structures en métal léger dans la construction aéronautique. ***Paul Rousset-Bert.*** *Corrosion et Anticorrosion,* v. 6, no. 9, Sept. 1958, p. 272-287.

14* Automatic Flight Control—Past, Present, and Future. Deals with control of conventional commercial aircraft. ***R. Hadekel.*** *Discovery,* v. 19, Oct. 1958, p. 410-416.

15 Flight Testing Gas Turbines on the Ground. Rolls-Royce Limited have constructed a test house in which turbojet and turboprop engines can be tried out under any altitude conditions likely to be met with in civil or military service. *Engineering,* v. 186, Oct. 3, 1958, p. 443-444.

16* The New Air Age. Points from papers at British Association Meeting. Discussion of reactor-shielding and space flight physiology. *Flight,* v. 74, Sept. 19, 1958, p. 484.

17* Honeycomb-Cell-Cores Sandwich Aircraft Construction. (*In German.*) Sandwich-Konstruktioen mit Wabenzellkernen im Flugzeugbau. ***E. W. Pleines.*** *Luftfahrttechnik,* v. 4. Sept. 1958, p. 230-243.

18 Sun to Cool Spaceship Electronic Components. Solar discs, developed by Northrop, could also power satellites by using well-known refrigeration principle. ***Raymond M. Nolan.*** *Missiles and Rockets,* v. 4, no. 15, Oct. 13, 1958, p. 39 + 1 page.

19 Structure and Heat at Supersonic and Hypersonic Speed. Outlines a program of work for the development of aeronautical materials and structures. (*In French.*) Structures et chaleur aux vitesses supersoniques et hypersoniques. ***B. Dorleac.*** *North Atlantic Treaty Organization, AGARD Report No.* 149, Nov. 1957, 92 pp. (TL565 Ag11r Vis.)

20 Aerodynamics of Low Density Media. The study of the effects of both low density and high speed in modern aerodynamics. ***G. N. Patterson.*** Paper from "Proceedings of the Seventh AGARD General Assembly", Advisory Group for Aeronautical Research and Development, Paris. 1957, p. 21-31. (TL500 Ag15p)

21 Propulsion at High Altitudes. Purpose is to discuss the effects of diminishing atmospheric pressure on the behavior of the various components of the propulsion units, and to consider the special testing and research required to ensure correct operation of the vehicle. (*In French and English.*) La propulsion aux grandes altitudes. ***M. Barrere, R. Siestrunck, and M. F. Florio.*** Paper from "Proceedings of the Seventh AGARD General Assembly", Advisory Group for Aeronautical Research and Development, Paris. 1957, p. 32-62. (TL500 Ag15p)

22 Human Parameters of Space Flight. ***Paul A. Campbell.*** Paper from "Proceedings of the Seventh AGARD General Assembly", Advisory Group for Aeronautical Research and Development, Paris. 1957, p. 63-73. (TL500 Ag15p)

23 Drag Unit for the Artificial Generation of Turbulent Shear Flow. Describes a device called a "drag unit" capable of generating turbulent shear flows of prescribed time-mean velocity distribution. The device can be used as a research tool to study features of turbulence or to ascertain the effects of flow nonuniformities. Typical experimental results are presented. ***H. G. Elrod.*** *Review of Scientific Instruments,* v. 29, Sept. 1958, p. 762-764.

24* Some Design Problems in Inertia Navigation. Describes some of the fundamental components of inertia navigation systems, and considers the problems involved in design and methods of testing. ***W. Cawood.*** *Royal Aeronautical Society, Journal,* v. 62, Oct. 1958, p. 704-722.

25* Sputnik III. Russia's new satellite, and its significance in the development of astronautics. ***Maurice Allward.*** *Spaceflight,* v. 1, no. 9, Oct. 1958, p. 303 + 5 pages.

26* Aerodynamic Thermal Conditions. Theoretical study of the aerodynamic thermal conditions of a fine fluid stream by pressure and friction and of the heat exchange between the air flow and an adiabatic plate. (*In French.*) L'échauffement aérodynamique. ***B. Brun.*** *Technique et Science Aéronautiques,* 1958, no. 1, Feb., p. 1-12.

27 A Summary and Analysis of the Low-Speed Longitudinal Characteristics of Swept Wings at High Reynolds Number. The low-speed longitudinal characteristics of swept wings derived primarily from investigations at high Reynolds numbers are summarized and analyzed. Methods of stall control applicable to each type of flow separation are discussed and the effectiveness of the various methods (devices and wing geometry) currently available is indicated. The important influence that the vertical position of the horizontal tail has on the over-all stability of airplane configurations both with and without stall-control devices is considered, and generalized procedures for predicting tail effectiveness are presented. The effectiveness of various high-lift devices in the linear lift range and at maximum lift is summarized, and the advantages of the various types are noted. ***G. Chester Furlong and James G. McHugh.*** *U. S. National Advisory Committee for Aeronautics, Report* 1339, 1957, 149 pp. (TL521 Un3r Vis.)

28 Relative Motion in the Terminal Phase of Interception of a Satellite or a Ballistic Missile. The interception of a satellite or a ballistic missile essentially outside the earth's atmosphere is considered with emphasis on the terminal phase of the attack vehicle's flight. ***Richard A. Hord.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4399, Sept. 1958, 33 pp. (TL570 Un3t Vis.)

29 Project Vanguard Report No. 31. The Vanguard Sequence Diagram, a Graphical Method of Presenting Complex System Operation. Presents a specific application of the sequence diagram to a rocket-powered vehicle, stabilized and directed by internal controls components, and depicts graphically the various states which exist during the nominal launching program. In addition, a brief nomenclature is included to identify the component states and functions. ***W. J. D. Escher and R. W. Foster.*** *U. S. Office of Naval Research. NRL Report* 5185, Aug. 15, 1958, 15 pp. (T21 Un3.5n Contin.)

See also: **707** (aircraft hydraulic systems); **719** (structural factors of safety).

AGRICULTURE

30* A Bacteriophage That Attacks Numerous Phytopathogenic *Xanthomonas* Species. Including *X. campestris,* the cause of black rot disease of crucifers. ***M. D. Sutton, H. Katznelson, and C. Quadling.*** *Canadian Journal of Microbiology,* v. 4, no. 5, Oct. 1958, p. 493-497 + 1 plate.

31* The Taxonomy of Insect Pathogens Related to *Bacillus cereus* Frankland and Frankland. The characteristics of seven crystal-forming *Bacillus spp.* are compared and an identification key is presented. ***A. M. Heimpel and T. A. Angus.*** *Canadian Journal of Microbiology,* v. 4, no. 5, Oct. 1958, p. 531-541.

32* The Potential Contribution of Atomic Energy to Development in Agriculture and Related Industries. ***R. A. Silow.*** *International Journal of Applied Radiation and Isotopes,* v. 3, no. 4, Aug. 1958, p. 257-280.

33 Identification of Translocated Regulating Chemicals Through Plant Response and Chromatography. ***Bernard C.***

Smale and Eleanor J. Daly. *Journal of Agricultural and Food Chemistry,* v. 6, Oct. 1958, p. 751-752.

34* Significance of Dietary Zinc for the Growing Chicken. *B. L. O'Dell, P. M. Newberne, and J. E. Savage.* *Journal of Nutrition,* v. 65, no. 4, Aug. 1958, p. 503-523.

35* Factors Affecting the Ability of Plants to Absorb Phosphate From Soils. III. Plant-Physiological Effects of Iron. Shows that the transfer of phosphate to plant shoots is reduced by ferric iron applied prior to or simultaneously with phosphate. ***W. N. M. Foster and R. Scott Russell.*** *Journal of Soil Science,* v. 9, no. 2, Sept. 1958, p. 280-288.

36 Trace Elements. Proceedings of the Conference Held at the Ohio Agricultural Experiment Station, Wooster, Ohio, Oct. 14-16, 1957. *C. A. Lamb, O. G. Bentley, and J. M. Beattie, editors.* 410 pp. 1958. Academic Press, New York. (QK867 T67)

See also: **514** (pesticide trends in 1958).

BIOCHEMISTRY AND BIOPHYSICS

37* Delayed Effects of Ionizing Radiations in Man. *John L. Tullis.* *AMA Archives of Pathology,* v. 66, Oct. 1958, p. 403-417.

38* Pathogenesis of Metastasis Formation Observed *in Vivo* in the Rabbit Ear Chamber. Injected cancer cells passed rapidly from the arterioles into the capillary bed, where they became firmly adherent to the endothelium. After a latent period of only a few minutes, intracapillary thrombus formation about the adherent cancer cells was first noted. Within 30 minutes to several hours, the endothelium subjacent to the cancer cells was altered. Tumor cells which had incompletely penetrated the endothelium were covered by endothelial proliferation within 24 hours, and flow through the parent vessel was reestablished. Such subendothelial tumor cells subsequently grew and infiltrated the connective tissue. ***Sumner Wood, Jr.*** *AMA Archives of Pathology,* v. 66, Oct. 1958, p. 550-568.

39* Vaccination Against the Yoshida Rat Ascites Sarcoma. III. Intracoecal vaccination against the Yoshida ascites sarcoma of the rat is possible with 15-25 million sarcoma cells while intracoecal injection of cell-free ascites sarcoma fluid is not followed by resistance. No tumor cells could be demonstrated in the peritoneal cavity after intracoecal injection. Injection of the tumor into the duodenum or ileum is followed by either resistance or by the development of intraabdominal tumors. By injection into the ascending colon a good, but not total vaccinatory effect was observed. After oral treatment of fasting rats with bacitracin and neomycin; cultures of the coecal contents showed complete disappearance of coliform organisms, enterococci and anaërobes. By intracoecal injection of the Yoshida ascites sarcoma in 10 rats thus treated, seven were found to have developed tumors of the coecal wall. Such tumors were not observed after intracoecal injection in previously untreated animals. ***Michael Petri and Helge J. C. Lund.*** *Acta Pathologica et Microbiologica Scandinavica,* v. 44, no. 1, 1958, p. 106-111.

40* On Chloroplast Proteins. *N. M. Sissakian.* *Agrochimica,* v. 2, no. 3, June 1958, p. 191-206 + 1 plate.

41* Mitotic Activity of Cells of Lymph Glands in a Dog, Acted Upon by Different Doses of Leucocytic Serum. Injections of 0.1, 1, 2, and 3 ml. of leucocytic serum per kg. of living weight of a dog, over a period of 11 days, increased the mitatic activity of the cells of lymph glands after 3 days of injection. Natural serum injected under identical conditions failed to increase the mitotic activity. (*In Russian.*) Mitoticheskaia aktivnost kletok limfaticheskikh uzlov sobaki pod vlianiem razlichnykh doz leikotsitarnoi syvorotki. ***A. F. Cherednichenko.*** *Akademiia Nauk SSSR, Doklady,* v. 120, no. 6, June 21, 1958, p. 1341-1344.

42* Leukemia in Mice and Some Features of Its Development Under the Action of Certain Inhibitors of Oxidizing Chain Processes. (*In Russian.*) Leikoz u mysheĭ i osobennosti ego razvitiia pri vozdeĭstvii ingibitorov tsepnykh okslitel'nykh protsessov. ***N. M. Emanuel' and L. P. Lipchina.*** *Akademiia Nauk SSSR, Doklady,* v. 121, no. 1, July 1, 1958, p. 141-144 + 1 plate.

43* Paramagnetic Resonance in Biology. (Spectra of Electron Paramagnetic Resonance and Their Application for Study of Biological Objects.) Analysis of principles and possibilities of using physical method of investigation (spectroscopy of electron paramagnetic resonance) for clarification of structure and reaction mechanisms of the most important biologic polymers - proteins and nucleic acids. (*In Russian.*) Paramagnitnyĭ rezonans v biologii. (Spektry elektronnogo paramagnitnogo rezonansa i ikh primenenie dlia issledovaniia biologicheskikh ob'ektov.) ***L. A. Bliumenfel'd.*** *Akademiia Nauk SSSR, Vestnik,* v. 28, no. 9, Sept. 1958, p. 22-29.

44* Polyploidy. (Contemporary Status of the Problem and Task of Investigation). Review of works connected with development of polyploids. (*In Russian.*) Poliploidiia. (Sovremennoe sostoianie problemy i zadachi issledovaniia.) ***P. A. Baranov.*** *Akademiia Nauk SSSR, Vestnik,* v. 28, no. 9, Sept. 1958, p. 30-37.

45 The Alkaline Denaturation of Deoxyribose Nucleic Acid. Deoxyribose nucleic acid (DNA) from calf thymus has been examined by sedimentation, viscosity, and light scattering methods in the *p*H range from 7 to 12.5. When the ionic strength is 0.15, it is found that the molecular configuration undergoes a sharp transition in the vicinity of *p*H 11.7. Above *p*H 11.9 the transition is complete and the DNA is found to retain its original mol. wt., but to have contracted in size. ***Paul Ehrlich and Paul Doty.*** *American Chemical Society, Journal,* v. 80, Aug. 20, 1958, p. 4251-4255.

46 Hexose Transport in Ascites Tumor Cells. The competitive inhibition of hexose utilization in ascites tumor cells by the non-utilizable hexose, galactose, has been ascribed to competition for a binding site which appears to be a functional part of the transport mechanism. Galactose inhibited neither hexose utilization by homogenates nor hexokinase action in extracts of the ascites tumors. ***Marshall W. Nirenberg and James F. Hogg.*** *American Chemical Society, Journal,* v. 80, Aug. 20, 1958, p. 4407-4412.

47 Nuclear Magnetic Resonance Spectra of Steroids. The high resolution nuclear magnetic resonance spectra of 47 steroids have been obtained and a number of peak positions have been measured with an accuracy of approximately 1 c.p.s. relative to the resonance of pure benzene. Empirical correlation of the data with the known steroid structures has allowed the assignment of characteristic group frequency shifts to a number of chemical functional groups. The applicability of these shifts to analysis of unknown steroids is discussed. Finally, the sensitivity of this method of analysis is discussed and found to be adequate to permit samples of a few milligrams to be studied. ***J. N. Shoolery and Max T. Rogers.*** *American Chemical Society, Journal,* v. 80, Oct. 5, 1958, p. 5121-5135.

48* Neighbor Group Effects in Organic Chemistry. (*In German.*) Nachbargruppen-Effekte in der organischen Chemie. ***W. Lwowski.*** *Angewandte Chemie,* v. 70, no. 16, Aug. 21, 1958, p. 483-495.

49* Antiviral Chemotherapy: Current Status. The most likely of some 2000 compounds tested for antiviral effect vary in chemical type and conceivable mechanism of action. The most promising include a quinoxaline derivative and a chelated manganese compound. The various possible sites of action include the free particle, attachment, penetration, eclipse, nucleic acid replication, protein coat formation, release, and energy support. ***Windsor Cutting and Arthur Furst.*** *Antibiotics & Chemotherapy,* v. 8, Sept. 1958, p. 441-445.

50* An Antifungal Antibiotic (AYF) Produced by a Strain of *Streptomyces aureofaciens.* Biological and chemical properties are described. ***M. A. Kaplan, et al.*** *Antibiotics & Chemotherapy,* v. 8, Oct. 1958, p. 491-495.

51* A New Antivirus Antibiotic—Violarine, Produced by Violet *Actinomyces.* Certain violet actinomycetes strains are endowed with both antivirus and antiphage properties. A strain

1212, is endowed with pronounced antiphage properties, especially with respect to actinophages. It produces an antivirus substance which affects the virus of influenza and that of smallpox vaccine (experiments on chick embryos), as well as the virus of tick encephalitis (experiments on animals). (*In Russian.*) Novyĭ antivirusnyĭ antibiotik—violarin, obrazuemyĭ fioletovym aktinomitsetom. ***N. A. Krasil'nikov, G. K. Skriabin, and O. I. Artamonova.*** *Antibiotiki*, v. 3, no. 3, May-June 1958, p. 18-22.

52* The Propagation of Mammalian Cells in a 20-Liter Stainless Steel Fermentor. Twenty-liter stainless steel fermentors were adapted for use in the propagation of mammalian cells in an agitated fluid suspension system. Cells of three different origins were readily cultured under the conditions described. The possibility of using submerged culture cells to produce viral vaccines, hormones, and other physiologically active cell products is indicated. ***D. W. Ziegler, E. V. Davis, W. J. Thomas, and W. F McLimans.*** *Applied Microbiology*, v. 6, no. 5, Sept. 1958, p. 305-310.

53* Studies on the Binding of Small Ions in Protein Solutions With the Use of Membrane Electrodes. VII. The Binding of the Alkali-Metal Ions in Solutions of Phosphoproteins. ***Charles W. Carr and Wendell P. Engelstad.*** *Archives of Biochemistry and Biophysics*, v. 77, no. 1, Sept. 1958, p. 158-167.

54* The Inhibition of Mitosis by the Reaction of Maleic Hydrazide With Sulphydryl Groups. Treated pea seeds germinated normally until cell enlargement was replaced by cell division, when growth stopped. Certain enzymes requiring free sulphydryl groups (starch phosphorylase and β-amylase) were inhibited irreversibly by maleic hydrazide, but other enzymes (trypsin and pea aldolase) were not affected. ***Clare Hughes and S. P. Spragg.*** *Biochemical Journal*, v. 70, no. 2, Oct. 1958, p. 205-212.

55* Preparation of Some Deoxyribonucleic Acid-Protein Complexes From Rat-Liver Homogenates. *p*-Aminosalicylate and diethyldithiocarbamate have been the only salts to produce a deoxyribonucleic acid nearly free from protein. No protein was taken up on deoxyribonucleic acid which was mixed with a rat-liver homogenate in the presence of benzoate. The relevance of these experiments to the nature of the deoxyribonucleic acid–protein bonding is discussed. ***K. S. Kirby.*** *Biochemical Journal*, v. 70, no. 2, Oct. 1958, p. 260-265.

56* Protein Synthesis and RNA Turnover in a Pyrimidine-Deficient Bacterium. The Apparent Mutagenicity of Thymine Deficiency. In an auxotrophic mutant of *E. coli* lack of exogenous thymine prevents DNA synthesis and lack of exogenous uracil inhibits net RNA synthesis. Lack of both pyrimidines prevents net nucleic acid synthesis, but does not prevent protein synthesis. The protein synthesized under such conditions may be directed by induction and be a specific enzyme such as xylose isomerase. ***Hazel D. Barner and Seymour S. Cohen.*** *Biochimica et Biophysica Acta*, v. 30, no. 1, Oct. 1958, p. 12-20.

57* An Enzymic Defect in Ascites-Tumor Cells. There is a complete absence of phosphorylase activity in eight different types of tumors. The cells were found to contain phosphorylase-activating enzymes but lacked specifically both active and inactive forms of phosphorylase. It is not known whether this defect occurs in non-neoplastic cells. All types of tumors tested resemble biochemical mutants insofar as all have a similar block in the normal hormonally-linked sequence of phosphorylase activation. ***Marshall W. Nirenberg.*** *Biochemica et Biophysica Acta*, v. 30, no. 1, Oct. 1958, p. 203-204.

58* Pathologic Anatomy of Experimental Leukemia Produced by Injection of Benzol Extracts From Organs of Leukemic Patients. Injections produced both intra- and extramedullary myeloid hyperplasia, characteristic of leukemia. The injection of one and the same benzol extract can bring about leukemia alone, leukemia plus tumor, or tumor alone. ***M. P. Khokhlova.*** *Blood*, v. 13, Oct. 1958, p. 917-925.

59* Tissue Culture in Cancer Chemotherapy Screening. ***Erich Hirschberg.*** *Cancer Research*, v. 18, no. 8, pt. 1, Sept. 1958, p. 869-878.

60* Inhibition of Ascites Cell Growth by Combinations of 6-Thioguanine and Azaserine. The Ehrlich ascites carcinoma, the sarcoma 180 ascites, and the TA 3 ascites carcinoma were found to be sensitive to combinations of azaserine plus thioguanine. The Mecca lymphosarcoma in either solid or ascites form and the 6C3HED lymphosarcoma ascites proved to be relatively resistant. For maximum tumor inhibition, thioguanine and azaserine must be administered simultaneously, supporting the concept that the two drugs establish concurrent blocks of purine nucleotide synthesis. ***Alan C. Sartorelli and G. A. LePage.*** *Cancer Research*, v. 18, no. 8, pt. 1, Sept. 1958, p. 938-942.

61* Cancer Chemotherapy Screening Data. I. ***Joseph Leiter, Ralph K. Barclay, Arthur Furst, Alfred Gellhorn, and Michael B. Shimkin, editors.*** *Cancer Research*, v. 18, no. 8, pt. 2, Sept. 1958, 713 pp.

62* Chemical Synthesis of C^{14} Tracer Marked Amino Acids and Pyrimidine Derivatives. (*In German.*) Über die chemische Synthese einiger ^{14}C-markierter Aminosäuren und ^{14}C-ringmarkierter Pyrmidinabkömmlinge. ***Ursula Drehmann.*** *Chemische Technik*, v. 10, no. 8, Aug. 1958, p. 474-475.

63* Isolating Psilocibine From *Stropharia cubensis* Earle and Other Species of Mexican Hallucinating Mushrooms Belonging to Genus *Psilocybe*. Psilocybin as an active principle was detected in 4 *Psilocybe* species. (*In French.*) Isolement de la psilocybine à partir du *Stropharia cubensis* Earle et d'autres espèces de champignons hallucinogènes mexicains appartenant au genre *Psilocybe*. ***Roger Heim and Albert Hofmann.*** *Comptes Rendus Hebdomadaries des Séances de l'Académie des Sciences*, v. 247, no. 5, Aug. 4, 1958, p. 557-561.

64* Induction of Malignant Tumors in Newborn Mouse by Means of an Injection of a Preparation of Ribonucleic Acid Extracted From Human Leukemic Glands. Three weeks after intraperitoneal injection of a phenol preparation of ribonucleic acid from human lymph glands malignant mesothelium developed at the point of inoculation. (*In French.*) Induction de tumeurs malignes chez le Souriceau nouveau-né, par injection d'une préparation d'acide ribonucléique extrait de ganglions leucémiques humains. ***Jacques Harel, Joseph Huppert, Fanny Lacour, and Jean Lecour.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 247, no. 10, Sept. 8, 1958, p. 795-796.

65 Pharmaceutical Fermentations, 1957. A statistical report of some fermentation products of international interest. ***Samuel C. Beesch and Fred W. Tanner, Jr.*** *Drug and Cosmetic Industry*, v. 93, no. 4, Oct. 1958, p. 438 + 11 pages.

66* High Negative Interference Over Short Segments of the Genetic Structure of Bacteriophage T4. The observed excess of double- and triple-recombinations is the result of short segments of the genetic structure. The frequency of such events is inversely realted to the length of the map interval being studied. ***Martha Chase and A. H. Doermann.*** *Genetics*, v. 43, no. 3, May 1958, p. 332-353.

67* Problems and Techniques Involved in Trace Element Essentiality Studies With Fungi—A Critical Appraisal. ***L. Saraswathi-Devi.*** *Indian Academy of Sciences, Proceedings*, v. 48, sec. B, no. 2, Aug. 1958, p. 96-108.

68* *p*-Iodobenzoyl Groups as a Paired Label for *in vivo* Protein Distribution Studies: Specific Localization of Anti-Tissue Antibodies. Describes the use of I^{131} and C^{14} for paired labeling in experiments of long duration where the short half-life of I^{131} precludes the use of the iodine paired label. ***M. Blau, A. C. Johnson, and D. Pressman.*** *International Journal of Applied Radiation and Isotopes*, v. 3, no. 3, Aug. 1958, p. 217-225.

69* Nucleoside Triphosphates as Precursors of Ribonucleic Acid End Groups in a Mammalian System. Nucleoside triphosphates of cytosine and adenine, and to a smaller extent uracil, serve as proximal precursors for the incorporation of the nucleoside monophosphates into the ribonucleic acid of the supernatant fraction of Ehrlich ascites carcinoma cells *in vitro*. Free ribonucleic acid, isolated from the supernatant fraction and added to the incubation system, also serves as acceptor of these nucleotides. Equal quantities of microsomal or nuclear

ribonucleic acid are almost inert. ***Liselotte I. Hecht, Paul C. Zamecnik, Mary L. Stephenson, and Jesse F. Scott.*** *Journal of Biological Chemistry*, v. 233, no. 4, Oct. 1958, p. 954-963.

70* Enzymatic Basis of Resistance to Aureomycin. II. Inhibition of Electron Transport in *Escherichia coli* by Aureomycin. Purified extracts derived from aureomycin-sensitive *Escherichia coli* (strain E-26) and its resistant variant reduce 2,6-dichlorophenol-indophenol and ferricyanide. It has been established that the cell-free phenol-indophenol reductase derived from the sensitive strain is inhibited by low concentrations of aureomycin whereas that derived from the resistant strain is resistant to the antibiotic. ***Arthur K. Saz and L. Marina Martinez.*** *Journal of Biological Chemistry*, v. 233, no. 4, Oct. 1958, p. 1020-1022.

71* An Effect of the iVtal Dye Trypan Red on Approach-Avoidance Conflict. Two groups of albino rats were trained in hunger-fear conflict. Following treatment, conflict tests indicated that trypan red had significantly attenuated conditioned fear in the experimental group, and that the effect endured for at least eight days. The author suggests that trypan red attenuates conditioned fear by staining and decreasing the permeability of the so-called blood-brain barrier. ***Paul H. Poschel.*** *Journal of Comparative and Physiological Psychology*, v. 51, no. 4, Aug. 1958, p. 448-451.

72* The Effect of a Stimulant and a Depressant Drug on a Measure of Reactive Inhibition. A stimulant drug, pipradrol, decreased alternation and a depressant, amobarbital, increased it. ***S. N. Sinha, Cyril M. Franks, and P. L. Broadhurst.*** *Journal of Experimental Psychology*, v. 56, no. 4, Oct. 1958, p. 349-354.

73* Studies on the Origin of Bacterial Viruses. I. The Incidence of Phage-Producing Cells in Various *B. megatherium* Cultures. II. The Effect of Ultraviolet Light on the Incidence of Phage-Producing Cells and of Terramycin-Resistant Cells. III. The Effect of Hydrogen Peroxide on the Incidence of Phage-Producing Cells and of Terramycin-Resistant Cells. IV. Calculation of the Incidence of Phage-Producing Cells. ***John H. Northrop.*** *Journal of General Physiology*, v. 42, no. 1, Sept. 1958, p. 109-136.

74* On the Reversibility of the Acid Denaturation of Sodium Desoxyribose Nucleate. The light scattering properties of acid-denatured DNA are interpreted in terms of a more heterogeneous distribution of macromolecular configurations than in the native material. ***E. Peter Geiduschek.*** *Journal of Polymer Science*, v. 31, Aug. 1958, p. 67-75.

75* Biosynthesis of Vitamin B_{12} and Folic Acid in the Intestinal Tract of Infants. Study of microflora and content of vitamin B_{12} and folic acid in feces of 37 infants in an age range from 3 days to 9 months. Results show that the biosynthesis of vitamin B_{12} in the intestines occurs simultaneously with an increase of number and types of gram-negative and gram-positive bacteria. Biosynthesis of folic acid was registered from the first day of life, regardless of character of nourishment. (*In Latvian.*) B_{12} vitamina un folijskābes biosinteze zidainu zarnu trakta. ***E. Kaleja.*** *Latvijas PSR Zinātnu Akademijas Vestis*, 1958, no. 7, p. 57-60.

76* The Interpretation of Bacterial Transformation Data. The treatment of bacterial transformation data is discussed and equations are developed connecting the variables. The observed number of transformants is the product of three factors, namely: the number of marked DNA molecules present, the ability of these molecules to enter the bacterium, and the ability of the molecules which have entered the cell to become part of the genome. ***Liebe F. Cavalieri and Barbara H. Rosenberg.*** *National Academy of Sciences, Proceedings*, v. 44, Sept. 1958, p. 853-857.

77* Radiation-Induced Mutation Rates in Female Mice. Mutation rates in females have been measured by the specific locus method in two experiments. An experiment with chronic γ-rays, which allowed almost normal fertility of the females, gave a rate of 5×10^{-5}/r/locus with a 95% confidence interval of 0.6 to 18×10^{-5}. This rate is significantly below that of 28×10^{-5}/r/locus found in males irradiated with a similar dose of acute X-irradiation. Possible reasons for the lower rate are discussed. ***W. L. Russell, Liane Brauch Russell, Josephine S. Gower, and Savanna C. Maddux.*** *National Academy of Sciences, Proceedings*, v. 44, Sept. 1958, p. 901-905.

78* Some Effects of Substituting the Deoxyribonucleic Acid of Isolated Nuclei With Other Polyelectrolytes. Up to 75% of the deoxyribonucleic acid of isolated thymocyte nuclei can be removed by incubation with pancreatic deoxyribonuclease. Nuclei so depleted of their DNA lose their capacity for ATP synthesis, for amino acid incorporation into protein, and for adenosine uptake into nuclear RNAs. ***V. G. Allfrey and A. E. Mirsky.*** *National Academy of Sciences, Proceedings*, v. 44, Oct. 1958, p. 981-991.

79 Carcinogenic Activity and O-Alkylation. Pure 8-methoxy-3:4-benzopyrene was synthesized and proved to be effective carcinogens for the skin and for the subcutaneous tissues of both mice and rats, surpassing in this respect the parent hydrocarbon. ***R. Schoental.*** *Nature*, v. 182, Sept. 13, 1958, p. 719-720.

80 Cytotoxicity of Heterologous Sera to Normal and Leukaemic Human Lymphocytes. Results showed that human leukaemic lymphocytes were sensitive to toxic factors in normal rabbit sera and in inactivated guinea pig sera. The rabbit sera usually killed the leukaemic lymphocytes in a few hours by "fixation" and killed normal lymphocytes in a few days by intranuclear vacuolization. The rabbits differed in the toxicity of their sera and the leukaemic patients varied in the sensitivity of their lymphocytes to the toxic factors. ***Robert Schrek.*** *Nature*, v. 182, Sept. 13, 1958, p. 724.

81 Architecture of a Protein Molecule. Presents two pictures of a model of the myoglobin molecule based on 3-dimensional electron density measurements having a resolution down to 6A. ***J. C. Kendrew.*** *Nature*, v. 182, Sept. 20, 1958, p. 764-767.

82 Ribonuclease and Deoxyribonuclease Activities During Normal and Neoplastic Growth. Normal tissue response to a growth stimulus involves a sharp increase in the activities of these enzymes. Neoplastic tissues do not seem to respond in this way. ***Sam Brody and M. Earl Balis.*** *Nature*, v. 182, Oct. 4, 1958, p. 940-941.

83 Distribution of Proflavin-Induced Mutations in the Genetic Fine Structure. Comparison of the distribution of r_{II} mutations induced by pyroflavin and by 5-bromouracil shows that these two mutagens act on completely different groups of sites in the genetic structure. ***S. Brenner, S. Benzer, and L. Barnett.*** *Nature*, v. 182, Oct. 11, 1958, p. 983-985.

84* Morphogenesis and Its Control in Tissue Cultures of Carrots. A culture isolated in 1954, after a few passages made normal growth only when the nutrient medium used during isolation was supplemented with coconut milk (7%) and when the indoleacetic acid level was raised from 10^{-7} g/ml to 10^{-5} g/ml. (*In German.*) Morphogenese und ihre Kontrolle an Gewebekulturen aus Carotten. ***J. Reinert.*** *Naturwissenschaften*, v. 45, no. 14, July 1958, p. 344-345.

85* The Effect of Ultraviolet Light on Some Components of the Nucleic Acids. II. In Rapidly Frozen Solutions. The sensitivity of some of the bases occurring in the nucleic acids to u. v. irradiation in a frozen solution is different from that in an aqueous solution. Thymine especially shows a very high sensitivity. ***R. Beukers, J. Ylstra, and W. Berends.*** *Recueil des Travaux Chimiques des Pays-Bas*, v. 77, Aug. 1958, p. 729-732.

86 Report of the United Nations Scientific Committee on the Effects of Atomic Radiation. Concludes that all steps designed to minimize irradiation of human populations will act to the benefit of human health. Such steps include the avoidance of unnecessary exposure resulting from medical, industrial, and other procedures for peaceful uses on the one hand and the cessation of contamination of the environment by explosions of nuclear weapons on the other. 228 pp. 1958. United Nations, New York. (RC91 Un2.3r Over.)

87* Species Differences in Cholesterol Biosynthesis by Arterial Tissue. Coronary arteries and aortas of humans and aortas of dogs, cats, and rats cannot incorporate C^{14}-labeled acetate into cholesterol *in vitro*. Aortas of guinea pigs, rabbits, and chickens can accomplish this conversion. ***Daniel L. Azar-***

noff. *Society for Experimental Biology and Medicine, Proceedings,* v. 98, no. 4, Aug.-Sept. 1958, p. 680-683.

88* Effects of 5-Flurouracil on Human Bronchogenic Carcinoma Grown in Hamster Cheek Pouch. Markedly inhibited the carcinoma but was very toxic to the host. ***Donald E. Wishnow and David K. Sirota.*** *Society for Experimental Biology and Medicine, Proceedings,* v. 98, no. 4, Aug.-Sept. 1958, p. 770-772.

89* Lactic Dehydrogenase Production in Tissue Culture of Normal, Transformed, and Malignant Human Cell Lines. The enzyme activity both in the cells and in the fluid bathing them was greatly increased in the malignant cell lines and in 2 transformed lines, in contrast to the normal cell lines and the conjunctiva cell line where large quantities did not appear in the media. ***Alice E. Moore and Felix Wroblewski.*** *Society for Experimental Biology and Medicine, Proceedings,* v. 98, no. 4, Aug.-Sept. 1958, p. 782-786.

90 Effects Produced by Ionizing Rays and Particles on Human Organism. (*In German.*) Die Wirkung ionisierender Strahlen und Teilchen auf den menschlichen Organismus. ***Held.*** *Technik,* v. 13, no. 8, Aug. 1958, p. 534-537.

91* Macrolide Antibiotics. VII. The Structure of Neomethymycin. Degradation experiments are described which establish structure for neomethymycin. This antibiotic belongs to the macrolide group and differs from methymycin only in the location of one hydroxyl group, which results in marked behavior. ***Carl Djerassi and O. Halpern.*** *Tetrahedron,* v. 3, no's. 3/4, Aug.-Sept. 1958, p. 255-268.

92* Quantitative Evaluation of Chemotherapeutic Agents Against Advanced Leukemia in Mice. Comparison was made of the relative effectiveness of compounds in increasing the survival time of the mice, employing the folic acid analogue amethopterin as a standard. Data on 38 compounds are presented. ***Abraham Goldin, John M. Venditti, Stewart R. Humphreys, and Nathan Mantel.*** *U. S. National Cancer Institute, Journal,* v. 21, no. 3, Sept. 1958, p. 495-511.

93* The Effects of Heterologous Immune Serums Upon HeLa Cells *in Vitro* and Rat-HeLa Tumors *in Vivo*. Heterologous immune serums against HeLa cells were prepared in rabbits, rats, and a tuberculin-sensitive cow. The effects of these immune serums *in vitro* upon HeLa cells were studied by means of a cytotoxic metabolic inhibition test (CMI), the complement-fixation test, and by agglutination tests. The CMI test was sensitive, quantitative, and reproducible. ***Robert M. McAllister, Paul W. Grunmeier, Lewis L. Coriell, and Robert R. Marshak.*** *U. S. National Cancer Institute, Journal,* v. 21, no. 3, Sept. 1958, p. 541-555.

94* Cytotoxic Antibodies in the Homograft Reaction. An analysis was made of the cytotoxic isoantibodies that can be demonstrated *in vitro* by the addition of complement, using, mainly, the strain specific tumors. It was shown that in the absence of added complement, cytotoxic antibodies do not produce a destruction of the tumor cells *in vivo*. Thus they seem to play no direct role in the homograft reaction. ***Leo Sachs and Michael Feldman.*** *U. S. National Cancer Institute, Journal,* v. 21, no. 3, Sept. 1958, p. 563-578.

95* The Radial Density Distribution in Some Strains of Tobacco Mosaic Virus. The strains differ from one another principally in the relative *heights* of the peaks in protein density; that is, in the weights of protein lying at particular radii. ***K. C. Holmes and Rosalind E. Franklin.*** *Virology,* v. 6, no. 2, Oct. 1958, p. 328-336.

96 The Year Book of Cancer. (1957-1958 Year Book Series). Concise abstracts of the more significant articles in the field of oncology which appeared during the preceding year; 235 articles, from a total of 4000 published during the year, were selected for inclusion in the year book. ***Randolph Lee Clark, Jr., editor.*** 523 pp. 1958. The Year Book Publishers, Chicago. (RC261 Y32)

97* Size and Structure of Ribose Nucleic Acid of the Tobacco Mosaic Virus. The structure and size of the infectious RNA were studied by measuring the sedimentation, viscosity and kinetics of the action of ribonuclease. A homogeneous sedimenting constituent of mol. weight $2 \cdot 10^6$ was obtained. (*In German.*) Grösse und Struktur der Ribosenucleinsäure des Tabakmosaikvirus. ***Alfred Gierer.*** *Zeitschrift für Naturforschung,* v. 13b, Aug. 1958, p. 477-484.

See also: **288** (potential purine antagonists); **541** (synthesis of milk); **661** (pharmaceutical literature searching).

CERAMICS AND CONCRETE

98 Hydraulic Cement for Water Tanks and Pipe Lines. A critical comparison of several types of portland cement. ***W. C. Hansen.*** *ASTM Bulletin,* 1958, no. 232, Sept., p. 51-54.

99 Cement Strengths in Mortars and Concretes. A comparison of strengths. ***Myron A. Swayze.*** *ASTM Bulletin,* 1958, no. 232, Sept., p. 54-57.

100 Investigation of Ceramic Materials in a Laboratory Rocket Motor. Thirty-four different ceramic materials were evaluated as nozzle liners in a laboratory rocket motor employing oxygen and hydrogen as the propellants. The motor was operated with a four-to-one volume ratio of H_2 and O_2 and with a chamber pressure of 200 p.s.i.a., giving a combustion temperature of about 4500 F. Functional life of the motor with the various experimental nozzles ranged from less than 15 to 107 seconds. ***J. F. Lynch, J. F. Quirk, and W. H. Duckworth.*** *American Ceramic Society Bulletin,* v. 37, Oct. 1958, p. 443-445.

101* Shearing Strength of Prestressed Lift Slabs. A research investigation on the ultimate shearing strength of reinforced and prestressed concrete lift slabs. ***A. C. Scordelis, T. Y. Lin, and H. R. May.*** *American Concrete Institute, Journal,* v. 30, no. 4, Oct. 1958; *ACI Proceedings,* v. 55, 1958, p. 485-506.

102 How They Make Silicon Carbide Heating Elements. Manufacturing techniques, testing procedures, characteristics. *Ceramic Industry,* v. 71, Oct. 1958, p. 104-106.

103* Steatite in Electro-Ceramics. Reviews the various forms of this material and describes their properties. ***R. W. Batchelor.*** *Ceramics,* v. 9, Sept. 1958, p. 11 + 4 pages.

104 Prestressed Concrete . . . Where Do We Stand? Prestressed concrete, popular in this country for only the last two or three years, shows need for more research and model testing facilities. ***Arthur M. James.*** *Consulting Engineer,* v. 11, Oct. 1958, p. 98 + 6 pages.

105 Special Report on Glass-Ceramics. Properties, manufacturing process, and applications. *Design News,* v. 13, Oct. 13, 1958, p. 20-21.

106 Texture of Refractory Construction Materials. (*In German.*) Über die Textur von feuerfesten Baustoffen. ***L. Žagar.*** *Deutsche Keramischen Gesellschaft, Berichte,* v. 35, Sept. 1958, p. 294-301.

107 Warping in Concrete Slabs is Studied. Two Purdue University researchers, Prof. Gerald A. Leonards and Prof. M. E. Harr, have derived formulas for the stresses and deflections in warped slabs. The formulas allow for the condition when the slab is only partially supported by its base. *Engineering News-Record,* v. 161, no. 16, Oct. 16, 1958, p. 73-74.

108 Ceramics. The presently more active areas for research and development in ceramics appear to be in glass, refractory materials for special applications, coatings for metals, and studies of a fundamental nature. The major research interest in the fields of porcelain enamel, brick or tile building materials, conventional refractories, and dinnerware has been mainly on problems of an economic nature. Among the most striking applications of ceramics currently are those in connection with developments in nuclear reactors, jet aircraft, and missiles. ***John W. Lennon.*** *Industrial and Engineering Chemistry,* v. 50, Sept. 1958, pt. 2, p. 1433-1437.

109* The System Lime-Alumina-Water at 1°C. A study was made of phase equilibria in the system CaO-Al_2O_3-H_2O at 1 C. ***Elmer T. Carlson.*** *Journal of Research, National Bureau of Standards,* v. 61, no. 1, July 1958, p. 1-11.

110* Properties of Sodium Titanium Silicate Glasses. The glass-forming area of the Na_2O-TiO_2-SiO_2 system was surveyed. Glasses were made with refractive indices from 1.5184 to 1.8005 and densities from 2.42 to 3.00. ***Edgar H. Hamilton and Given W. Cleek.*** *Journal of Research, National Bureau of Standards,* v. 61, no. 2, Aug. 1958, p. 89-94.

111 Determining Mechanical Properties of Brittle Cermets. Methods generally used to determine the mechanical properties of ceramics are evaluated. *National Bureau of Standards, Technical News Bulletin,* v. 42, Oct. 1958, p. 196-197.

112* Refraction of Titanium-Zirconium Silicon Glasses. Describes increase of refraction when SiO_2 is substituted by ZrO_2 and ZrO_2 by TiO_2. Confirms the refractory value of ZrO_2 for glasses containing no Ti. (*In Russian.*) Svetoprelomlenie titano-tsinkonievykh silikatnykh stekol. ***M. A. Bezborodov and I. S. Kachan.*** *Nauchnye Doklady Vysshei Shkoly. Khimiia i Tekhnologiia,* 1958, no. 3, p. 572-575.

113* Effect of the Phase Composition on the Mechanical Strength of Corundum. Effect of density and Al_2O_3 content. (*In Russian.*) O vliianii fazovogo sostava na mekhanicheskuiu prochnost' korundovoĭ keramiki. ***P. P. Budnikov, I. A. Bulavin, and I. A. Zakharov.*** *Nauchnye Doklady Vysshei Shkoly. Khimiia i Tekhnologiia,* 1958, no. 3, p. 576-579.

114* Phosphate Bonding of Refractory Compositions. A process of bonding alumina, zirconia, mullite, beryllia, or silicon carbide with phosphoric acid or aluminum phosphate, causing the mixture to set and making a true castable refractory, has been developed. ***Herbert D. Sheets, Jack J. Bulloff, and Winston H. Duckworth.*** *Refractories Journal,* v. 34, Sept. 1958, p. 402-406.

115* Spinel Refractories From Indian Bauxite. Development trials. ***J. C. Banerjee and N. B. Chatterjee.*** *Refractories Journal,* v. 34, Sept. 1958, p. 407-413.

116* Recent Developments in the Use of Vermiculite in the Ceramic Field. Reviews present applications and predict that this material will become one of the many new, important ceramic raw materials of the future. ***A. J. Gitter.*** *Refractories Journal,* v. 34, Sept. 1958, p. 435 + 5 pages.

117* New Knowledge and Experiences Gained in Connection With Cutting by Oxygen Powder Lance. Experiences in connection with the cutting of reinforced concrete. (*In German.*) Neuere Erfahrungen und Erkenntnisse beim Brennschneiden mit der Sauerstoff-Pulverlanze. ***Hans G. Kluge.*** *Schweissen und Schneiden,* v. 10, Sept. 1958, p. 368-373.

118* Structure of Fluoride Glass. II. Glass Systems MgF_2-BeF_2, CaF_2-BeF_2 and SrF_2-BeF_2. Preparation and properties of binary alkaline earth beryllium fluoride glass. On the basis of the coincidence of the molar volume curves for the system MgF_2-BeF_2 and CaF_2-BeF_2, it is assumed the magnesium fluoride plays a part in the formation of the BeF_4-tetrahedron lattice as MgF_4-tetrahedron. (*In German.*) Sur Struktur von Fluoridgläsern. II. Die Glassysteme MgF_2-BeF_2, CaF_2-BeF_2, und SrF_2-BeF_2. ***Werner Vogel and Klaus Gerth.*** *Silikattechnik,* v. 9, Aug. 1958, p. 353-358.

119* The Problem of Pressure Ring Formation in Rotary Cement Kilns. I. Absorption of ashes by clinker in the combustion chamber. Reactions between SO_3 and the charge. Formation of $CaSO_4$ and CaS. (*In German.*) Zum Problem der Stauringbildung in Zementdrehöfen. I. ***Erich Vogel.*** *Silikattechnik,* v. 9, Aug. 1958, p. 361-364.

120 The Behavior of UO_2 Bodies Subjected to Temperature Transients. The expansion behavior of UO_2 bodies subjected to temperature transients similar to those experienced during reactor power excursions are reported. ***U. C. Cohen and D. F. Molino.*** *U. S. Atomic Enrgy Commission, KAPL-1873,* July 1, 1957, 31 pp. (UF767 Un3.1ka Contin.)

121 Creep and Anelastic Studies of Al_2O_3. Summarizes work to date at Atomics International. Principal objective is to reach an understanding of the mechanisms of these processes. ***Roger Chang.*** *U. S. Atomic Energy Commission, NAA-SR-2770,* 24 pp. (UF767 Un3.1na Contin.)

See also: **703** (concrete slab roof for auditoriums); **704** (folded-slab concrete construction); **856** (ceramic tools); **878** (slip casting cermets); **881** (slip casting of metal powders); **1050** (properties of $NiMnO_3$ and $CoMnO_3$); **1054** (magnetic properties of $NiMnO_3$).

CHEMICAL ENGINEERING

122 Boiling Heat Transfer to Water Containing a Volatile Additive. Emphasis is placed on the improvement in smoothness of boiling and in the decrease of average bubble size when the additive (alcohol) is present, as contrasted with boiling distilled water. ***G. Leppert, C. P. Costello, and B. M. Hoglund.*** *ASME, Transactions,* v. 80, no. 7, Oct. 1958, p. 1395-1404.

123* Hydrogen From Petroleum and Its Uses. I. Recently vast quantities of H have become available as a by-product from the petroleum industry. How these are being utilized is discussed. ***R. P. Northcott and H. T. Porter.*** *British Chemical Engineering,* v. 3, Oct. 1958, p. 542-545.

124* Chemicals From Quebec Peat Bogs. Latest study on this potential raw material. *Canadian Chemical Processing,* v. 42, Sept. 1958, p. 85 + 2 pages.

125 How to Scale Up Pilot Plant Data and Equipment. Each experimental-plant item must be designed with the end in view that the end use of the data is to be an expansion to industrial-size equipment and the experimental program must be arranged to provide data suitable for this extrapolation. ***E. L. Clark.*** *Chemical Engineering,* v. 65, Oct. 6, 1958, p. 129-140.

126 Speed Heat Exchanger Computations. New charts for finding tubeside heat transfer coefficients and pressure drops in the tubes, not only when streamline flow occurs. ***Ning Hsing Chen.*** *Chemical Engineering,* v. 65, Oct. 6, 1958, p. 149-152.

127 Methods of Improving Heat Transfer in Evaporators of Small Thermocompression Sea-Water Stills. The problem of reducing scaling remains one of the most critical problems yet to be solved in sea-water evaporation. The best method now known for reducing scaling appears to be the periodic injection of citric or other acids. Results show that substantial improvements in heat transfer can be expected from dropwise condensation and forced-circulation evaporation. ***J. A. Eibling and D. L. Hyatt.*** *Chemical Engineering Progress,* v. 54, Oct. 1958, p. 84-86.

128 Chemical Reaction Engineering. Twelfth meeting of the European Federation of Chemical Engineering, Amsterdam, May 7-9, 1957. ***P. V. Danckwerts and R. F. Baddour, editors.*** 200 pp. 1957. Pergamon Press, New York. (TP5 Eu74c)

129* Ammonium - Sodium - Cation Treatment of Limed Water. Comparative experiments with two parallel equally loaded filters working with the same original water: one regenerates with NaCl + NH_4Cl mixture, the other with NaCl solution. The combined ammonium-sodium-cation treatment of limed water is very efficient. (*In Russian.*) Ammoniĭnatrĭĭkationirovanie izvestkovannoĭ vody. ***M. D. Starkova.*** *Energetik,* v. 6, no. 9, Sept. 1958, p. 17.

130 Application of Automatic Techniques in the Handling of Physical Data for a Modern Refinery. Concept of automatic data handling as applied in the design, construction, and instrumentation of one of the world's most modern refineries. ***Wm. G. Deutsch.*** *IRE Transactions on Industrial Electronics, PGIE-7,* Aug. 1958, p. 23-26. (TK1 In6.6ie Vis.)

131* Thermal and Catalytic Cracking, Aromatisation and Hydrogenation of High Boiling Paraffinic Petroleum Hydrocarbons Under Pressure. Processes in the production of gaso-

lines of high anti-knock quality from high boiling petroleum fractions are carried out either at atmospheric or at high pressures. ***M. Ramacharyulu, S. Sourirajan, and S. S. Ghosh.*** *Indian Institute of Science, Journal,* v. 40, sec. A, no. 3, July 1958, p. 111-131.

132 Eleventh Annual Review of Unit Processes in Chemical Engineering. Recent developments in alkylation, amination by reduction, decomposition of hydrocarbons, pyrolytic and catalytic esterification, fermentation, halogenation, hydration and hydrolysis, hydrogenation and hydrogenolysis, nitration, oxidation-liquid phase, polymerization, pyrolysis of coal and shale, sulfonation and sulfation, and Friedel-Crafts acylations. *Industrial and Engineering Chemistry,* v. 50, Sept. 1958, pt. 2, p. 1316-1425.

133 Twelfth Annual Review of Materials of Construction. Characteristics and uses of Al alloys, ceramics, elastomers, fibers, Pb and its alloys, less common metals, Ni, including high-nickel alloys, plastics, protective coatings, stainless steels including other ferrous alloys, tin and its alloys, Ti, and wood. *Industrial and Engineering Chemistry,* v. 50, Sept. 1958, pt. 2, p. 1426-1498.

134 Screw Extrusion Theory With Application to Double-Base Propellant. Data on solids conveying in screw extruders aid in designing presses for solid and semisolid flow and in scale-up of propellant extruders. ***M. L. Jackson, F. J. Lavacot, and H. R. Richards.*** *Industrial and Engineering Chemistry,* v. 50, Oct. 1958, p. 1569-1576.

135 Fifty Years of Petroleum Refining and Petrochemicals. Greatly expanded research effort on petroleum refining techniques has led to new and improved products of tremendous importance to industry and the consuming public. ***E. J. Gohr and C. L. Fleming, Jr.*** *Industrial and Engineering Chemistry,* v. 50, Oct. 1958, p. 52A-55A.

136* Water Economy in Iron and Steel Works. Description of open and closed circulating systems. Vapor cooling. Water purification. Economic considerations. (*In German.*) Wasserwirtschaft in Eisenhüttenbetrieben. ***Friedrich Wesemann.*** *Jernkontorets Annaler,* v. 142, no. 6, 1958, p. 271-288.

137 First Pentane Isomerization Unit. Is designed to handle a maximum of 34,400 bbl. per day of 85% normal pentane reactor feed and produces approximately 16,000 bbl. per day of 95% isopentane. ***L. E. Dean, H. R. Harris, D. H. Belden, and Vladimir Haensel.*** *Oil and Gas Journal,* v. 56, no. 39, Sept. 29, 1958, p. 54-56.

138 New Two-Way Process Sweetens Gas and Recovers Sulfur. Can be designed to replace the Claus process in converting acid gases from amine-type gas treaters. ***Laurance S. Reid and F. Mark Townsend.*** *Oil and Gas Journal,* v. 56, no. 41, Oct. 13, 1958, p. 120 + 3 pages.

139 Electronic-Controlled Cat Cracker. ***C. D. Gingrich.*** *Oil and Gas Journal,* v. 56, no. 42, Oct. 20, 1958, p. 77-81.

140* Underground Storage for Hydrocarbon Fluids. Storage of large volumes of the above directly against rock, without lining of any kind, is comparatively recent. ***R. L. Loofbourow.*** *Petroleum,* v. 21, Oct. 1958, p. 347 + 5 pages.

141 Three Stage Unit Improves Crude Split. Greater product flexibility is achieved with this new three stage crude distillation unit. Now greater quantities of residual fuel oil can be upgraded to gasoline and fuel oil. ***G. W. Wharton and E. P. Hardin.*** *Petroleum Refiner,* v. 37, Oct. 1958, p. 105-108.

142 A Check List for Plant Layout. Whether it's a refinery or petrochemical plant, these tips will help to attain maximum flexibility and compactness at a reasonable first cost. ***John F. McGarry.*** *Petroleum Refiner,* v. 37, Oct. 1958, p. 109-110.

143 Fusion-Cast High Explosives. The microstructures of fusion-cast TNT, amatol, pentolite, RDX/TNT, and CE/TNT are described from data obtained by novel microscopical techniques. They are correlated with the detonative properties of TNT and the rheological properties of partially molten slurries of RDX/TNT. ***W. O. Williamson.*** *Research,* v. 11, Oct. 1958, p. 387-393.

144 Saline Water Conversion Report for 1957. In this report and the Secretary's letter report of the activities for the past year, some of the more outstanding research and development conducted since the beginning of the program is described. 128 pp. 1958. United States Department of the Interior, Washington, D. C. (QH88 Un3.4a)

145 Four-Tower Water Treatment Test Facility. Report on a four-tower water treatment test facility which was built for the study of corrosion in Cu condenser tubes. ***R. G. Murray and M. E. Tester.*** *U. S. Atomic Energy Commission,* GAT-247, Sept. 23, 1958, 17 pp. (UF767 Un3.1ga Contin.)

146* Simplicity in Control Systems. Article deals with selection of the simplest control system in the field of water treatment and distribution. ***C. S. Beard.*** *Water & Sewage Works* (Reference Number), v. 105, Sept. 15, 1958, p. R-74-R-77.

147* Chlorination of Water. I. Reviews the fundamental principles of chlorination processes, especially as they relate to conventional water and waste treatment practices. ***Edmund J. Laubusch.*** *Water & Sewage Works,* v. 105, Oct. 1958, p. 411-417.

148* Petrochemical Horizons for Propylene. II. Acrolein, Glycerin, and Propylene Glycol. ***Peter W. Sherwood.*** *World Petroleum,* v. 29, Oct. 1958, p. 60 + 2 pages.

See also: **509** (buyers guide); **718** (filtering hydraulic circuits).

CHEMISTRY—ANALYTICAL

149* Determination of Synthetic Detergent Content of Raw-Water Supplies. The methylene blue and infrared processes for determination of alkyl benzene sulfonate are evaluated. ***James C. Vaughn.*** *American Water Works Association, Journal,* v. 50, Oct. 1958, p. 1343-1352.

150* Determination of Copper in Titanium, Zirconium and Their Alloys. A rapid direct absorptiometric method, based on the blue color produced by the reaction of Cu ions with bis*cyclo*hexanone oxalyldihydrazone, is suitable over the range 0.005 to about 3% of Cu. ***D. F. Wood and R. T. Clark.*** *Analyst,* v. 83, Sept. 1958, p. 509-516.

151* Blue Tetrazolium as a Reagent for Reducing Steroids. Extremely pure samples of blue tetrazolium give rise only to the characteristic indigo-blue formazan on reduction. It is concluded that the reddish products are not partial reduction products, but typical formazans derived from tetrazolium salts other than blue tetrazolium. ***I. E. Bush and Muriel M. Gale.*** *Analyst,* v. 83, Sept. 1958, p. 532-536.

152* Paper Chromatography in the Separation of Ions. II. Separation of Precious Metals. III. Separation of Silver, Copper, and Arsenic Group Elements. ***A. K. Majumdar and M. M. Chakrabartty.*** *Analytica Chimica Acta,* v. 19, no. 2, Aug. 1958, p. 129-134.

153* Determination of Uranium in Uranium Hexafluoride Material. A rapid and precise method for the determination of U in UF_6 material that contains essentially no non-volatile impurities. ***C. A. Kienberger.*** *Analytica Chimica Acta,* v. 19, no. 4, Oct. 1958, p. 338-341.

154* Determination of Uranium, Zirconium, Magnesium, and Iron in Bismuth Alloys. ***K. W. Kirby and R. H. A. Crawley.*** *Analytica Chimica Acta,* v. 19, no. 4, Oct. 1958, p. 363-368.

155 Nonaqueous Titration of 2,4-Dinitrophenylhydrazones. The 2,4-dinitrophenylhydrazones of aldehydes and ketones can be titrated as weak acids with tetrabutylammonium hydroxide. This provides another simple and rapid method for the identification of this important group of carbonyl derivatives. ***A. J. Sensabaugh, R. H. Cundiff, and P. C. Markunas.*** *Analytical Chemistry,* v. 30, Sept. 1958, p. 1445-1447.

156 Titration of Acids in Nonaqueous Solutions. An Improved Quaternary Ammonium Hydroxide Titrant for Strong Acids. Impurities may be eliminated by passing the titrant, tetrabutylammonium hydroxide, through a short section of a strongly basic anion exchange column. This yields a titrant suitable for determining all types of acids and acid mixtures. ***Robert H. Cundiff and Peter C. Markunas.*** *Analytical Chemistry*, v. 30, Sept. 1958, p. 1450-1452.

157 Indirect Complexometric Analysis With Aid of Liquid Amalgams. The application of liquid amalgams lends a new perspective to the field of complexometric titrations. The principle involves reduction of one or more components of the sample by a metal amalgam with liberation of an equivalent quantity of metal ion from the amalgam. Thus, species which are not readily amenable to direct EDTA titration can be reduced with Zn amalgam, the Zn ions liberated being easily titrated. Another application is to exchange an easily masked metal for one that is not masked, or vice versa. ***William G. Scribner and Charles N. Reilley.*** *Analytical Chemistry*, v. 30, Sept. 1958, p. 1452-1462.

158 Activation Analysis With an Antimony-Beryllium Neutron Source. An evaluation study is made of several types of scintillation detectors in conjunction with a portable Sb-Be neutron source for activation analysis. ***Anil K. De and W. Wayne Meinke.*** *Analytical Chemistry*, v. 30, Sept. 1958, p. 1474-1482.

159 X-Ray Powder Diffraction Patterns of Phosphorus Compounds With Nitrogen. X-ray powder diffraction data are given for the identification of 41 phosphorus-nitrogen compounds including phosphoramidates, phosphorodiamidates, trimetaphosphimates, and tetrametaphosphimates. Eleven new compounds are reported. ***Arno H. Herzog and Morris L. Nielsen.*** *Analytical Chemistry*, v. 30, Sept. 1958, p. 1490-1496.

160 Spectrochemical Method for the Determination of Selenium. Selenium can be determined in pyrite, chalcocite, and marcasite by a simple and rapid spectrochemical method that requires no complicated arrangement of spectrographic equipment or chemical pretreatment of samples. Advantage is taken of the new short wave length radiation plates (Eastman) and the addition of copper oxide to enhance the Se lines 2039.85 and 2062.78 A. ***Claude L. Waring, Helen W. Worthing, and Katherine V. Hazel.*** *Analytical Chemistry*, v. 30, Sept. 1958, p. 1504-1506.

161 Determination of Trace Quantities of Nitrogen in Petroleum Fractions. The method devised comprises the isolation of N compounds by extraction with concentrated H_2SO_4. A conventional Kjeldahl digestion of the acid extract is carried out, followed by neutralization of the excess acid and distillation of the ammonia from a basic medium. The ammonia is absorbed in an acidic solution and determined colorimetrically by reaction with phenol and hypochlorite to form a blue indophenol. ***O. I. Milner, R. J. Zahner, L. S. Hepner, and W. H. Cowell.*** *Analytical Chemistry*, v. 30, Sept. 1958, p. 1528-1530.

162 Near Infrared Analysis of Mixtures of Primary and Secondary Aromatic Amines. By utilizing the N-H overtone and combination bands near 1.49 and 1.97 microns, respectively, mixtures of aniline and N-ethylaniline containing up to 99% of either constituent can be analyzed with standard deviations no greater than ± 1%. ***Kermit Whetsel, William E. Roberson, and Max W. Krell.*** *Analytical Chemistry*, v. 30, Oct. 1958, p. 1594-1597.

163 Volumetric Determination of Thorium in Uranium Alloys. An analytical method to determine 0.1 to 3% Th in U alloys which may contain W or Ti. Thorium is precipitated as the fluoride, using La as a carrier, followed by titration with EDTA. ***Hobart H. Willard, Arthur W. Mosen, and Ross D. Gardner.*** *Analytical Chemistry*, v. 30, Oct. 1958, p. 1614-1616.

164 Paper Chromatography of Streptothricin Antibiotics. Differentiation and Fractionation Studies. Circular paper chromatography is a superior technique for separation of antibiotics of the streptothricin group. The solvent system is *n*-propyl alcohol-pyridine-acetic acid-water (15:10:3:12). On a preparative scale, separation is effected by powdered cellulose column technique using the same solvent system. ***Martin I. Horowitz and Carl P. Schaffner.*** *Analytical Chmistry*, v. 30, Oct. 1958, p. 1616-1620.

165 Cathodic Electrodeposition Methods for Cobalt. Methods are reviewed. Residual Co is due to a washing effect on the deposit and results from the surface compounds formed when Co concentration is less than 0.005*N*. ***Darnell Salyer and Thomas R. Sweet.*** *Analytical Chemistry*, v. 30, Oct. 1958, p. 1632-1635.

166 Rapid Polarographic Method for Hydroperoxides in Gasolines. ***Marvin L. Whisman and Barton H. Eccleston.*** *Analytical Chemistry*, v. 30, Oct. 1958, p. 1638-1640.

167 Improved Method for Determining Ketones in Lacquer Solvents. New Direct Application to Lacquer Vehicles. The hydroxylamine method is studied and modified. Proper adjustment of the alcohol-water ratio inhibits the adverse effects on the reaction from trace amounts of HCl found in hydroxylamine reagents. ***G. G. Esposito and M. H. Swann.*** *Analytical Chemistry*, v. 30, Oct. 1958, p. 1643-1645.

168 Spectrophotometric Determination of Thorium With 2-(4 - Carboxy-3-hydroxyphenylazo)-1, 8-dihydroxynaphthalene-3,6-disulfonic Acid. The violet complex absorbs at 580 m μ at pH 2.5. Iron, Zr, Ce, Au, phosphates, and fluorides interfere. Method is applied to determine Th in monazite and black sands extracts. ***Sachindra Kumar Datta.*** *Analytical Chemistry*, v. 30, Oct. 1958, p. 1653-1656.

169 Determination of Sulfur Oxides in Stack Gases. Sulfur trioxide is absorbed in 80% isopropyl alcohol solution and titrated with $BaCl_2$. A modification is used for determining total sulfur oxides. ***Edwin B. Seidman.*** *Analytical Chemistry*, v. 30, Oct. 1958, p. 1680-1682.

170 Determination of Silicon, Germanium, and Tin in Their Volatile Organo Compounds. Silicon, Ge, and Sn in volatile organo compounds are analyzed by a dry combustion technique. The oxides formed are absorbed in asbestos, and the value calculated through a weight differential of the asbestos. ***Michael P. Brown and Gerald W. A. Fowles.*** *Analytical Chemistry*, v. 30, Oct. 1958, p. 1689-1691.

171* Application of Ethylenediaminetetraacetate Titration to the Determination of Zinc in Zinc Bacitracin. Titration with EDTA in the presence of Eriochrome Black T indicator was found to require only a few minutes and to yield results comparing very favorably with those obtained by 8-hydroxyquinoline precipitation. ***Jessalyne L. Charles and Peter J. Weiss.*** *Antibiotics & Chemotherapy*, v. 8, Oct. 1958, p. 496-499.

172 Faster Amino Acid Analysis. Boosting temperatures for paper chromatography means more rapid quantitative determinations in amino acid determinations. *Chemical and Engineering News*, v. 36, no. 38, Sept. 22, 1958, p. 80.

173 Submicro-Methods for the Analysis of Organic Compounds. IV. The Determination of Iodine and Bromine. Bromine or iodine in organic compounds is determined by decomposing a 50 μ g. sample in a sealed tube with molten metallic Na. The iodide is oxidized with Br. water to iodate and bromide is oxidized to bromate with hypochlorite; the determinations are completed iodometrically. ***R. Belcher, R. A. Shah, and T. S. West.*** *Chemical Society, Journal*, 1958, Sept., p. 2998-3002.

174* Chelatometric Determination of Sulfates in Water Using "Calecin" as Indicator. (*In Czech.*) Chelatometrické stanovení síranů ve vodách za použití kalceinu jako indikátoru. ***Miloš Effenberger.*** *Chemické Listy*, v. 52, no. 8, Aug. 1958, p. 1501-1505.

175* Quantitative Organic Analysis. XIX. Microdetermination of Alkoxy Groups. XX. Study of the Method for Microassay of Chlorine in Organic Substances by Means of Combustion in an Empty Tube. (*In Czech.*) Organická kvantitativní analysa. XIX. Mikrostanovení alkoxylových skupin. ***Miroslav Večeřa and Antonín Spěvák.*** XX. Studie metody k mikrostanovení chloru v organických látkách spalováním v prázdné trubici. ***Miroslav Vecera and Jaroslav Bulušek.*** *Chemické Listy*, v. 52, no. 8, Aug. 1958, p. 1520-1536.

176 Gas-Liquid Chromatographic Resolution of *m*- and *p*-Xylene: Tetrahalophthalate Liquid Phases. *S. H. Langer, C. Zahn, and G. Pantazoplos.* *Chemistry & Industry*, 1958, no. 35, Aug. 30, p. 1145-1147.

177* Application of the Radio Indicator Method to Organic Analysis. Advantages and limitation of the activation method. Use of a radioactive reagent, showing that methyl radioiodide facilitates analysis of a mixture of amino acids. Determining the γ isomer of benzene hexachloride by the isotopic dilution method. (*In French.*) Application de la méthode des radio-indicateurs à l'analyse organique. ***Pascaline Daudel.*** *Chimie Analytique*, v. 40, no. 9, Sept. 1958, p. 325-331.

178* Method of Determining Combined Carbon and Free Carbon by Means of the Selective Oxidoreduction of Iron Carbides. Method based on the reaction of iron carbides in contact with an atmosphere of H_2 and steam. The conditions of reaction depend largely on the divided state of the substance being analyzed. (*In French.*) Sur une méthode de dosage du carbone combiné et du carbone libre par oxydoréduction sélective des carbures de fer. ***Fernand Marion and René Faivre.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 247, no. 2, July 16, 1958, p. 206-208.

179* Using Copper as an Exchange Cation in the Separation of Rare Earths by Means of Ion Exchange With the Help of Ethylenediaminetetraacetic Acid. The following improvements are obtained: the rare earths in complex solution with the acid can be fixed selectively on a resin saturated with Cu^{2+} ions. Separations are obtained by means of the acid and a ring of Cu^{2+} cations in the columns. (*In French.*) Utilisation du cuivre comme cation échangeur dans la séparation des terres rares par échange d'ions à l'aide de l'acide éthylène-diaminotétra-acétique. ***Jean Loriers and Claudine Lenoir.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 247, no. 4, July 28, 1958, p. 468-471.

180* On the Analysis of Essential Oils by Means of Vapor-Liquid Partition Chromatography, in General; the Analysis of Citronella and Lemongrass Essential Oils, in Particular. Heterogeneity of the qualitative and quantitative chemical composition of most essential oils. Simplification of analysis by using H or He as gaseous carrier, and the right "internal standard": benzyl acetate for citronella oil and acetophenone for lemon grass. (*In French.*) Sur l'analyse des huiles essentielles par la chromatographie de partition vapeurs-liquide, en général, et sur celle des hu'iles essentielles de citronelle et de lemongrass, en particulier. ***Yves-René Naves and Aldo Odermatt.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 247, no. 7, Aug. 18, 1958, p. 687-689.

181 Quantitative Flame Spectrometric Determination of K, Na, Ca, and Al in Kaolin. During the process Al is not separated from the other elements. Treatment with hydrofluoric acid/oxalic acid; interference effects; increase of Al-response by addition of organic substances, especially n-butanol. (*In German.*) Die quantitative flammenspektrometrische Bestimmung von K, Na, Ca und Al in Kaolin. ***Fr. Hegemann and W. Hert.*** *Deutsche Keramischen Gesellschaft, Berichte*, v. 35, no. 8, Aug. 1958, p. 258-263.

182* Determination of Thorium in the Parts per Million Range in Rocks. The procedure is applicable to felsic or mafic rocks. ***Harry Levine and Frank S. Grimaldi.*** *Geochimica et Cosmochimica Acta*, v. 14, nos. 1/2, Aug. 1958, p. 93-97.

183* The Specific Weight Quotient Method, a Simplified Routine Method of Determining the Hydrogen Content in Cast Aluminum Alloys. (*In German.*) Die Bestimmung des Gasgehaltes in Aluminiumlegierungen nach dem Wichtequotientenverfahren. ***Philipp Schneider and Wolfgang Büchen.*** *Giesserei*, v. 45, no. 19, Sept. 11, 1958, p. 561-565.

184* Complexometric Determination of Lead in Antifriction Metals and Solders. A direct complexometric determination of lead in alloys with indicators Eriochrome Black T or methylthymolblue is suitable for all sorts of Pb-base alloys with the Pb content $>$ 10 per cent. (*In Czech.*) Z Hutní Analytiky. Komplexometrické stanovení olova v ložiskových kovech a pájkách. ***Karel Studlar and Ivan Janoušek.*** *Hutnické Listy*, v. 13, no. 9, Sept. 1958, p. 805-808.

185 Stable Isotope Dilution Chemical Analysis by Mass Spectrometry. A very sensitive method, particularly applicable to trace elements or when only small samples are available. ***R. K. Webster.*** *Industrial Chemist*, v. 34, Sept. 1958, p. 495-501.

186* Gas Chromatography of Light Hydrocarbons and Inert Gas (CO_2, CO, N_2, O_2, H_2). The mode of operation includes two stages. During the first one the analysis of the hydrocarbons and CO_2 is made. The second stage comprises the analysis of the inert gases by means of a column containing molecular sieves. (*In French.*) Chromatographie gazeuse d'hydrocarbures légers et de gaz inertes (CO_2, CO, N_2, O_2, H_2). ***J. Rombaut and C. Fodderie.*** *Industrie Chimique Belge*, v. 23, no. 8, Aug. 1958, p. 845-854.

187 Determination of *N*-*m*-Tolyl Phthalamic Acid Residues in Food Crops. Method is useful at the 0.1-p.p.m. level. ***J. R. Lane, Delora K. Gullstrom, and J. E. Newell.*** *Journal of Agricultural and Food Chemistry*, v. 6, Oct. 1958, p. 753-754.

188 Analytical Separation of the Methyl Esters of the C_8-C_{34} Straight-Chain Fatty Acids and the Detection of Odd-Carbon-Number Acids in Commercial Mixtures of Fatty Acids by Gas Chromatography. A gas-chromatographic technique is described whereby fatty acids up to C_{34} may be separated as their methyl esters. Application to commercial fatty acid mixtures revealed the presence of acids with odd numbers of C atoms and small amounts of acids hitherto unidentified in such mixtures. ***M. A. Khan and B. T. Whitham.*** *Journal of Applied Chemistry*, v. 8, Sept. 1958, p. 549-552.

189* Amino Acid Analysis by Horizontal Paper Chromatography. Various modifications of the circular paper chromatographic method for the quantitative determination of amino acids in protein hydrolysates were investigated. ***Jacqueline Chartier, F. W. Van Klaveren, and G. Vaillancourt.*** *Journal of Chromatography*, v. 1, no. 4, July 1958, p. 317-326.

190* Qualitative, Quantitative and Preparative Chromatography of Steroids on Fully Acetylated Paper. I. Qualitative Chromatography of Δ^4- and $\Delta^{1,4}$-3-Ketosteroids. A wide range of Δ^4- and $\Delta^{1,4}$-3-ketosteroids, from weakly polar to strongly polar, may be chromatographed and detected on cellulose triacetate paper, with benzene-methanol-water mixtures as developing solvents. Three systems have been worked out. ***F. J. Ritter and J. Hartel.*** *Journal of Chromatography*, v. 1, no. 5, Sept. 1958, p. 461-470.

191 Radiochemical Procedure for Beryllium. A procedure for the determination of Be activity in the presence of mixed fission products and U. Decontamination is achieved by adsorption of contaminants on anion-exchange resin from HCl solution, by ferric hydroxide scavenging, and by extraction of Be acetylacetonate from a weakly acidic EDTA solution. ***John D. Buchanan.*** *Journal of Inorganic and Nuclear Chemistry*, v. 7, nos. 1-2, Aug.-Sept. 1958, p. 140-142.

192 X-Ray Absorption Microanalysis With Fine-Focus Tubes. A point focus X-ray tube was used as a source for microanalysis by the X-ray absorption method. Transmission measurements on selected specimen areas of 2-10μ diameter are possible, with wavelengths chosen by a crystal and a proportional counter. Comparison of the transmitted intensities at different wavelengths gives quantitative information on the mass thickness of elements present in the area examined. ***J. V. P. Long.*** *Journal of Scientific Instruments*, v. 35, Sept. 1958, p. 323-329.

193* Instrumental Methods in Non-Aqueous Titrimetry. Application of such techniques as photometry, thermometry, and those involving the flow of an electric current are summarized. ***John T. Stock and William C. Purdy.*** *Laboratory Practice*, v. 7, Sept. 1958, p. 523-525.

194* Recent Developments in Gas Chromatography. I. The new types of combustion detectors and ionization detectors are considered along with column efficiency. ***R. P. W. Scott.*** *Manufacturing Chemist*, v. 29, Oct. 1958, p. 411-416.

195 Ethylenediamine Tetra-Acetic and Allied Compounds in Metallurgical Analysis. A survey of the extensive literature

on the application of Complexones in metallurgical analysis. ***E. G. Brown.*** *Metallurgia*, v. 58, Sept. 1958, p. 149-159.

196* Spectrographic Analysis of the Leaching Solutions of Lead and Zinc Ores. A rapid approximate method for the determination of Pb, Fe, and Zn. (*In Italian.*) Analisi spettrografica di soluzioni provenienti dall'attacco di minerali di piombo e zinco. ***M. Civera.*** *Metallurgia Italiana*, v. 50, Aug. 1958, p. 329-331.

197* An Automatic Method for Elementary Micro Analyses. A method for automatically controlled combustion in organic elementary micro analysis is described. ***Tetsuro Kóno.*** *Mikrochimica Acta*, 1958, no. 4, p. 461-481.

198* Photometric Determination of Titanium and Its Separation From Iron, Chromium, Nickel and Other Elements by Means of the Highly Basic Anion Exchanger Amberlite I.R.A.-400. (*In German.*) Photometrische Bestimmung von Titan und dessen Trennung von Eisen, Chrom, Nickel und anderen Elementen mittels des stark basischen Anionenaustauschers Amberlite I.R.A.-400. ***J. Korkisch and A. Farag.*** *Mikrochimica Acta*, 1958, no. 5, p. 659-673.

199 Separation of Some Tobacco Alkaloids by Gas Chromatography. Preliminary results clearly indicating the usefulness of gas chromatography in the study of the tobacco alkaloids are reported. ***Louis D. Quin.*** *Nature*, v. 182, Sept. 27, 1958, p. 865.

200* Determination of Chlorinated Rubber and Polyvinyl Chloride in the Presence of Each Other. Method involves the use of chloroform which dissolves the chlorinated rubber but not the polyvinyl chloride. The Cl content of the chlorinated rubber and polyvinyl chloride is then determined by a procedure that involves a closed fusion system. ***George Norwitz.*** *Official Digest*, v. 30, Oct. 1958, p. 1049-1058.

201* The Routine Assay of Tritium in Water and Labelled Substances in the Range 20 to 10^4 $\mu\mu$c. A detailed method for the determination of radioactive hydrogen in a proportional gas counter which is easy to operate and requires very little maintenance. ***P. R. Payne and J. Done.*** *Physics in Medicine and Biology*, v. 3, no. 1, July 1958, p. 16-26.

202* Vibrational Spectroscopy and Its Application in Structural Inorganic Chemistry. Theoretical basis and applications. ***J. B. Willis.*** *Reviews of Pure and Applied Chemistry*, v. 8, no. 2, June 1958, p. 101-128.

203 Quantitative Determination of Dithiocarbamates and Thiuram Sulfides. A spectrophotometric method for the analysis of certain dithiocarbamates and thiuram sulfides in rubber stocks. ***C. L. Hilton and J. E. Newell.*** *Rubber Age*, v. 83, no. 6, Sept. 1958, p. 981-984.

204* Determination of Vanadium in Metals (Iron-Vanadium-Vanadium Alloys, etc.) and Vanadic Acids. An approximately 0.1% accurate value can be obtained by carrying out the entire determination under the control of a potentiometer, with suitable modification of the apparent potential of the Fe^{2+} system by means of a complexing agent such as H_3PO_4. (*In French.*) Dosage du vanadium dans les métaux (ferro-vanadium-vanadium-alliages, etc.) et les acides vanadiques. ***Francis Nouyrigat.*** *Société Chimique de France, Bulletin*, 1958, no. 6, June, p. 781-785.

205* The Efficiency of Columns for Gas Phase Chromatography. Study of the factors influencing the effectiveness of a chromatographic column: nature of the isotherm of distribution; volume of the sample; dimensions of the column; nature of the carrier gas, adsorbent, and support; pressures at the inlet and outlet; column temperature; nature of the stationary liquid. (*In French.*) L'efficacité des colonnes pour chromatographie en phase gazeuse. ***P. Chovin.*** *Société Chimique de France, Bulletin*, 1958, no. 7, July, p. 905-910.

206* Extraction and Analysis of Gases Dissolved in a Water. Developing a quantitative analysis of a natural water by extraction in vacuum and examination on mercury trough. The mineral water analyzed contained H_2S and CO_2. (*In French.*) Sur l'extraction et l'analyse des gas dissous dans une eau. ***Marthe Bastick and Henri Guérin.*** *Société Chimique de France, Bulletin*, 1958, nos. 8-9, Aug.-Sept., p. 1119-1122.

207* About the Determination of the Mineral Components in Clays. The most common methods for the determination and quantitative estimation of the minerals in clays have been considered. ***G. Serwatzky.*** *Sprechsaal*, v. 91, no. 17, Sept. 5, 1958, p. 396-406.

208* Determination of Sulfur in a Slag That Contains Fluorine (Combustion Method—Chelatometry). (*In Japanese.*) ***T. Miyate.*** *Tetsu to Hagané (Journal of the Iron and Steel Institute of Japan)*, v. 44, no. 9, Sept. 1958, p. 1050-1052.

209* Paper Electrophoresis of Carbohydrates in the Presence of Organic Solvents. Conditions of electrophoresis of sugars, using a series of solvents. The motion of sugars on the paper was produced only in the presence of anhydrous methanol. A dilution with water from 10 to 15% was necessary for the other solvents. (*In Russian.*) Elektroforez uglevodov na bumage v prisutstvii organicheskikh rastvoriteleĭ. ***I. R. Rominskiĭ and I. P. Cirko.*** *Ukrainskiĭ Khimicheskiĭ Zhurnal*, v. 24, no. 3, 1958, p. 369-371.

210 Collected Radiochemical Procedures (Radiochemical Group J-11). The chemistry of the elements on the basis of electronic configuration is discussed. Numerous separation procedures are outlined. ***Jacob Kleinberg, compiler.*** *U. S. Atomic Energy Commission, LA*-1721 (2nd Ed.), Aug. 18, 1958, sections individually paged. (UF767 Un3La Contin.)

211 Detection of Uncombined Oxygen in Zirconium Metal. Describes a method of determining O which is evolved as molecular O when solid Zr metal is dissolved in HF solution. The O evolved is ultimately determined colorimetrically as I. ***Louis Silverman and Wanda Bradshaw.*** *U. S. Atomic Energy Commission, NAA-SR*-2633, June 1, 1958, 14 pp. (UF767 Un3.1na Contin.)

212 Determination of Low Concentrations of Methane in Coal-Mine-Air Samples by Infrared Absorption Spectrometry. ***P. J. Colbassani and H. A. Watson.*** *U. S. Bureau of Mines Information Circular* 7839, 1958, 13 pp. (TN21 Un3i Vis.)

213* Thermal Analysis of Organic Compounds and the Application of This Method of Analysis to Isomer Systems. Difficulty of finding the exact solidification points of 2 or 3 component mixtures. Relationship between definite composition and definite temperature. Binary and ternary fusion diagrams of mononitrotoluene. Limit of validity of ideal laws for isomer mixtures. (*In German.*) Über die thermische Analyse von organischen Verbindungen und die Anwendung dieser Analysenmethode bei Isomeren-Systemen. ***E. Bonauguri and G. C. Bernardi.*** *Zeitschrift für Analytische Chemie*, v. 162, no. 4, 1958, p. 241-256.

214* Organic, Water Immiscible Solvents in Flame Photometry. Determination of Copper After Extraction as Internal Complex Compound. Effect of the solvent on the sensitiveness of the flame photometric copper determination in 40 different organic solvents, in which internal complex compounds of Cu were solved with organic compounds. Aliphatic esters and ketones such as phenyl ethers, benzene, toluene, and xylol were very suitable. (*In German.*) Organische, mit Wasser nicht mischbare Lösungsmittel in der Flammenphotometrie. Die Bestimmung des Kupfers nach Extraktion als Innerkomplexverbindung. ***Helmut Bode and Horst Fabian.*** *Zeitschrift für Analytische Chemie*, v. 162, no. 5, 1958, p. 328-336.

215* Determination of Barium and Strontium in Vaporization Products of Oxide Cathodes by Means of Paper Chromatography. Hydrochloric methanol-water solvent mixture is the most suitable for separating evaporation products. (*In German.*) Bestimmung von Barium und Strontium in Verdampfungsprodukten von Oxydkathoden durch Papierchromatographie. ***W. Düsing and H. Kunze.*** *Zeitschrift für Analytische Chemie*, v. 162, no. 5, 1958, p. 345-356.

216* Phthalocyanines as Oxidation-Reduction Indicators. II. Use of Copper Phthalocyanine Tetrasulphonic Acid (Cu-PTS). Cerimetric Determination of Uranium(IV), Molybdenum(V) and Arsenic(III). ***T. S. Sastri and G. Gopala Rao.*** *Zeitschrift für Analytische Chemie*, v. 163, no. 1, 1958, p. 1-6.

217* 2-Mercaptoquinoline (Thiocarbostyril) as an Analytical Reagent for Copper and Palladium. 2-Mercaptoquinoline is introduced as a sensitive and selective reagent for Cu and Pd. ***J. Xavier.*** *Zeitschrift für Analytische Chemie,* v. 163, no. 3, 1958, p. 182-187.

218* Flame Photometric Strontium Determination in the Presence of Ca, Ba, Mg, and Y for Chemicoagricultural Purposes in Soil Extracts and Plant Ashes. Determination of Sr as chloride in the air-acetylene flame at wavelength 4607 Å. Barium, Ca, Mg, and Y strengthen the emission progressively. Larger Ba quantities can be separated as $BaCrO_4$ at pH 4.5 in the presence of NH_4OOCCH_3, using ammonium dichromate. (*In German.*) Die flammenphotometrische Strontiumbestimmung in Gengewart von Ca, Ba, Mg und Y für agrikulturchemische Zwecke in Bodenauszügen und Pflanzenaschen. ***H. Kick.*** *Zeitschrift für Analytische Chemie,* v. 163, no. 4, 1958, p. 252-262.

219* Phthalocyanines as Oxidation-Reduction Indicators. III. Use of Copper Phthalocyanine Tetrasulphonic Acid. Titration of Hydroquinone and Metol With Ceric Sulphate Solution. IV. Use of Copper Phthalocyanine Tetrasulphonic Acid (Cu-PTS). Titration of Iron (II), Ferrocyanide and Uranium (IV) With Permanganate. ***T. P. Sastri and G. Gopala Rao.*** *Zeitschrift für Analytische Chemie,* v. 163, no. 4, 1958, p. 263-272.

220* Use of Orgnic Reagents in Inorganic Analysis. VII. Gravimetric Determination of Uranium With Phenyl Glycine-O-Carboxylic Acid. ***Sachindra Kumar Datta.*** *Zeitschrift für Analytische Chemie,* v. 163, no. 5, 1958, p. 349-352.

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221* A Study of the Vanadium Tellurides. The existence of two intermediate phases, β and γ, was established in the system vanadium-tellurium. ***Fredrik Gronvold, Olaf Hagberg and Haakon Haraldsen.*** *Acta Chemica Scandinavica,* v. 12, no. 5, 1958, p. 971-982.

222* On the Interaction of the Chlorides of Hafnium, Niobium, and Tantalum With Phosphorus Chloride. Reports studies on phase transformations in the systems $HfCl_4$—$POCl_3$, $NbCl_5$—$PoCl_3$, $TaCl_5$—$POCl_3$ and investigations of the interaction processes of the chlorides of Hf, Nb, and Ta with phosphorous chloride in nitrobenzene and benzene by the cryoscopic method. The formation of the compounds $HfCl_4 \cdot 2POCl_3$, $HfCl_4 \cdot POCl_3$, $NbCl_5 \cdot POCl_3$, and $TaCl_5 \cdot POCl_3$ is proved. (*In Ukrainian.*) Pro vzaemodiiu khloridiv gafniiu, niobiiu i tantalu z oksikhloridom fosforu. ***B. A. Voitovich and I. A. Sheka.*** *Akademiia Nauk Ukrains'koi RSR, Dopovidi,* 1958, no. 8, p. 849-852.

223 Bismuth(I) Chloride. Formed by the reaction of $BiCl_3$ with excess bismuth below 323 C. Isolated in 98 to 99% purity by sublimation or benzene extraction of the unreacted $BiCl_3$ from the BiCl-$BiCl_3$ mixtures. ***John D. Corbett.*** *American Chemical Society, Journal,* v. 80, Sept. 20, 1958, p. 4757-4760.

224 The Lower Oxidation States of Gallium. III. The Constitution of Ga_2Cl_4 and Its Analogy With $Ga(AlCl_4)$. Concludes that Ga_2Cl_4 exists in benzene as the solvated ion pairs $Ga^+(GaCl_4)^-$ which aggregate with increasing concentration. ***Richard K. McMullan and John D. Corbett.*** *American Chemical Society, Journal,* v. 80, Sept. 20, 1958, p. 4761-4764.

225 The Fluoroplatinates. IV. Preparation, Density and Solubility of the Fluoroplatinates of Magnesium and the Alkaline Earth Metals. The fluoroplatinates of Mg, Ca and Sr were prepared by the reaction of fluoroplatinic acid with the oxide, hydroxide, and carbonate of the respective metals. The barium fluoroplatinate was prepared by the reaction of lanthanum fluoroplatinate with $BaCl_2$. ***Marriner K. Norr, Theodore P. Perros, and Charles R. Naeser.*** *American Chemical Society, Journal,* v. 80, Oct. 5, 1958, p. 5035-5036.

226 Detemination of Combining Weight of Sulfonates. Typical results are listed on sulfonates of widely varying combining weight. Experience in running several hundred samples has shown that combining weights on two samples of separately purified material will usually differ by not more than 1% of the average value. ***C. M. Gardner, C. H. Hale, E. A. Setzkorn, and W. C. Woelfel.*** *Analytical Chemistry,* v. 30, Oct. 1958, p. 1712-1713.

227* An X-Ray Investigation of the Structure of Silver Iodide, Silver Thiocyanate, and Silver Thiosulphate Complexes in Solution. Result show that it is possible to evaluate the short distances between the heavy atoms in the ions in the solutions. It is not possible, however, to establish the complete structure of the polynuclear ions, especially when the ligand ion contains more than one atom. ***Rolf O. Nilsson.*** *Arkiv för Kemi,* v. 12, no. 6, 1958, p. 513-531.

228* Pyrolysis of Pu(IV) and Pu(III) Oxalates. (*In Russian.*) Termicheskoe razlozhenie oksalatov chetyrekhvalentnogo i trekhvalentnogo plutoniia. ***R. E. Kartushova, T. I. Rudenko, and V. V. Fomin.*** *Atomnaia Energiia,* v. 5, no. 1, July 1958, p. 24-28.

229 Organometallic and Organometalloidal Fluorine Compounds. XIV. Trifluoromethyl Derivatives of Selenium. Trifluoriodomethane and Se at 260-285 C give $(CF_3)_2Se$, and $(CF_3)_2Se_2$ in a ratio of about 4 : 1. ***J. W. Dale, H. J. Emeléus, and R. N. Haszeldine.*** *Chemical Society, Journal,* 1958, Sept., p. 2939-2945.

230* Effects of Aluminum and Boron Impurities on the Optical Absorption of Vitreous Germanium Dioxide. Vitreous GeO_2 has two absorption bands usually at 2450 and 2050 Å due to a lack of O. Introducing Al "whitens" the 2450 Å band but has no effect on the 2050 Å band. An attempt was made to interpret the effect of the Al impurity by supposing that this impurity replaces Ge at the center of the GeO_4 tetrahedra. (*In French.*) Action des impuretés aluminium et bore sur l'absorption optique du bioxyde de germanium vitreux. ***Vittorio Garino-Canina.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences,* v. 247, no. 6, Aug. 11, 1958, p. 643-646.

231* Recent Progress in the Chemistry of Fluorine and Its Compounds. Preparation and properties of F-containing organometallic compounds and halogen fluorides. (*In French.*) Quelques récents progrès dans la chimie du fluor et de ses composés. ***M. H. J. Emeleus.*** *Industrie Chimique Belge,* v. 23, no. 8, Aug. 1958, p. 837-844.

232* Silicon: Present and Future. Present and future uses are discussed with particular reference to those involving metallurgical and kindred processes. ***Walter E. Remmers.*** *Modern Castings,* v. 34, Oct. 1958, p. 47-52.

233* Infrared Spectrum of Sulfuryl Bromofluoride. ***T. T. Crow and R. T. Lagemann.*** *Spectrochimica Acta,* v. 12, nos. 2/3, Sept. 1958, p. 143-146.

234 Precipitation of Thorium as Thorium Hydride From Thorium-Magnesium Solutions. The precipitation reaction was investigated at 665-810 C. It is accomplished by equilibrating the Th-Mg solutions with H gas at 1 atm. pressure. ***Paul F. Woerner and P. Chiotti.*** *U. S. Atomic Energy Commission, ISC-928,* Aug. 1957, 42 pp. (UF767 Un3.1is Contin.)

235 Complex Metal Halides in Fused Alkali Nitrates. Results of this investiagtion provide additional information by chemical methods of the extent of association in fused salts. Association effects observed in solubility and rate studies in fused alkali nitrate are shown to be consistent with the assumption that complex ions such as those existing in aqueous solutions are formed between metal ions and halide ions. ***Marlowe L. Iverson and F. R. Duke.*** *U. S. Atomic Energy Commission, ISC-943,* Dec. 1957, 75 pp. (UF767 Un3.1is Contin.)

236 Reactivity of Certain Uranium Oxides With Aluminum. The reaction between UO_2 and Al was studied at 600 C and below. ***A. L. Eiss.*** *U. S. Atomic Energy Commission, SCNC-257,* Feb. 10, 1958, 26 pp. (UF767 Un3.1scn Contin.)

237* Iron(II, III) Fluorides. Preparation and properties of $Fe_2F_5 \cdot 7\ H_2O$ (= $FeF_2 \cdot FeF_3 \cdot 7\ H_2O$), $Fe_2F_5 \cdot 3\ H_2O$, and Fe_2F_5. (*In German.*) Eisen(II, III)-fluoride. ***G. Brauer and M.***

Eichner. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 296, nos. 1-6, Aug. 1958, p. 13-19.

238* Cobalt(III) Complexes of Tetraamine Phosphates. Various modes of preparation of $[Co(NH_3)_4PO_4] \cdot 2\ H_2O$ are described. The best one was found to be the reaction between $[Co(NH_3)_4(H_2O)_2]Cl_3$ and $(NH_4)_2HPO_4$. (*In German.*) Zur Kenntnis der Phosphato-tetrammin-kobalt(III)-Komplexe. ***Hans Siebert.*** *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 296, nos. 1-6, Aug. 1958, p. 280-286.

See also: **492** (semiconducting properties in organic compounds).

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239* A Study of the Pyrazoles Formed by Reaction Between *p*-Carboxyphenylhydrazine and Some β-Diketones. The statement that pyrazole derivatives crystallizing with 1 mole of water, and not *p*-carboxyphenylhydrazones, are formed when reacting β-diketones with *p*-carboxyphenylhydrazine, has been corroborated by investigating the UV- and the IR-absorption of the derivatives as well as their titration curves when titrated as acids and as bases. ***Stig Veibel, Bent Juhl Nielsen, and Susanne Refn.*** *Acta Chemica Scandinavica*, v. 12, no. 5, 1958, p. 934-938.

240* Carbonation of Paradichlorobenzene. A systematic investigation of reaction between CO and dichlorobenzene, and establishment of relationship between direction of reaction and factors affecting the reaction. In the presence of Ni catalysts terephthalic and parachlorobenzoic acids are obtained. (*In Russian.*) Karbonilirovanie paradikhlorbenzola. ***S. E. Iakushkina and N. V. Kisliakova.*** *Akademiia Nauk SSSR, Izvestiia, Otdelenie Khimicheskikh Nauk*, 1958, no. 9, Sept., p. 1119-1122.

241* Hydrolysis of Acetic Ethyl Ester in the Presence of Oxidized Carbon. Oxidized C, in contrast to the considerably more bulky carboxylic cation-exchange resin of the KB-4 type, is a good catalyst for the hydrolysis reaction of acetic ethyl ester. Concludes that the catalyst activity of oxidized C, as well as its capacity for cation exchange in an acid medium, is due to H ions connected with the adsorbent surface electrochemically. (*In Ukrainian.*) Gidroliz otstovoetilovogo efiru v prisutnosti okislenogo vugillia. ***Z. D. Skripnik, L. L. Cherviatsova, and G. F. Iankovs'ka.*** *Akademiia Nauk Ukrains'koi RSR, Dopovidi*, 1958, no. 8, p. 853-856.

242 Synthesis of Amino Sugars by Reduction of Hydrazine Derivatives. Reduction of the hydrazino compounds formed by the replacement of sulfonyloxy group in the sugar series provides a convenient approach. ***M. L. Wolfrom, F. Shafizadeh, and R. K. Armstrong.*** *American Chemical Society, Journal*, v. 80, Sept. 20, 1958, p. 4885-4888.

243 Synthesis of Potential Anticancer Agents. XV. Ribonucleosides of 2-Substituted Purines. Several new 2-substituted 9-β-D-ribofuranosylpurines from 2-chloro-9-β-D-ribofuranosyl-purine were synthesized. ***Howard J. Schaeffer and H. Jeanette Thomas.*** *American Chemical Society, Journal*, v. 80, Sept. 20, 1958, p. 4896-4899.

244 Synthesis and Reactions of Ring A Methylated Saturated Steroids. ***Yehuda Mazur and Franz Sondheimer.*** *American Chemical Society, Journal*, v. 80, Oct. 5, 1958, p. 5220-5229.

245 Reductions With Ruthenium Catalysts. I. Preparation of Some Cyclohexylalkylamines. Reduction of β-phenylalkylamines with Ru gave excellent yields of ring hydrogenated products. ***Morris Freifelder and George R. Stone.*** *American Chemical Society, Journal*, v. 80, Oct. 5, 1958, p. 5270-5272.

246 Reactions of Perchloryl Fluoride With Organic Compounds. I. Perchlorylation of Aromatic Compounds. Perchloryl fluoride undergoes a Friedel-Crafts type of reaction with aromatic compounds in the presence of $AlCl_3$ to give the novel perchlorylbenzene compounds, an entirely new series of aromatics. Evidence is presented in support of the structure Ar-ClO_2. ***C. E. Inman, R. E. Oesterling, and E. A. Tyczkowski.*** *American Chemical Society, Journal*, v. 80, Oct. 5, 1958, p. 5286-5288.

247 A Review of Ethylene Oxide Condensation With Relation to Surface-Active Agents. A discussion of some of the more important aspects. As a commercial process it is an economical means of introducing hydrophilic ethoxy groups to achieve the desired balance with lipophiles. ***R. D. Fine.*** *American Oil Chemists' Society, Journal*, v. 35, Oct. 1958, p. 542-547

248* Preparation and Study of the Polycondensation Reaction of a Hydroxylated Amino Acid, 10-Hydroxy-11-amino-undecanoic Acid. The formula was determined for this amino acid and for other amino acids having a similar structure. Kinetics of the bridging reaction between the linear chains. Radiographic study of 10-polyhydroxy undecanamide. (*In French.*) Préparation et étude de la réaction de polycondensation d'un amino-acide hydroxylé: l'amino-11 hydroxy-10 undécanoïque. ***M. Despas.*** *Annales de Chimie*, v. 3, July-Aug. 1958, p. 496-554 + 1 plate.

249 Synthesis of N-Substituted Diisopropanolamines, Their Sebacate Polyesters and Polyurethane Elastomers. Several of the above were prepared by reacting aqueous solutions of amines with excess propylene oxide at ordinary pressure, but higher N-substituted diisopropanolamines had to be prepared in an autoclave at 200 C. ***Jean L. Boivin.*** *Canadian Journal of Chemistry*, v. 36, Oct. 1958, p. 1405-1409.

250 Synthesis and Properties of Dehydropyridocolinium Salts. Several dehydropyridocolinium salts were prepared by treating the enol ether or the monoacetal of a β-diketone with 2-picolyl-lithium and cyclizing the resulting alcohol with acid. Their reactions, especially with anionoid reagents, were examined. ***A. Richards and T. S. Stevens.*** *Chemical Society, Journal*, 1958, Sept., p. 3067-3073.

251 The Preparation of Optically Active Phosphorus Compounds. The synthese of methyl methyl-l-naphthylphosphinate, methyl 1-naphthyl methylphosphonate, and S-benzyl methyl-3-phenanthrylphosphinothiolate are described. The last two esters have been partially resolved by means of their complexes with (−)-a-(2,4,5,7-tetranitro-9-fluorenylideneamino-oxy) propionic acid. ***M. Green and R. F. Hudson.*** *Chemical Society, Journal*, 1958, Sept., p. 3129-3133.

252* Synthetic Studies on the Benzofuran Derivatives. III. Reaction of 7-Hydroxy-8-formyl-2-methylisoflavone With Ethyl Bromomalonate and Synthesis of Furano(2',3':7,8)-2-methylisoflavone. IV. A New Synthesis of Benzyl 2-Methoxyphenyl Ketones and a Synthesis of Benzyl 4-Methoxy-5-benzofuranyl Ketone (Benzyl *O*-Methyl-karanjyl Ketone). V. Synthesis of Furano(2'3':7,8)-isoflavone. III. ***Takashi Matsumoto, Yoshiyuki Kawase, Mutsumu Nanbu, and Kenji Fukui.*** **IV.** ***Yoshiyuki Kawase, Teruo Fujimoto, and Kenji Fukui.*** **V.** ***Kenji Fukui and Yoshiyuki Kawase.*** *Chemical Society of Japan, Bulletin*, v. 31, no. 6, Sept. 1958, p. 688-695.

253* Stereochemical Studies. VIII. Synthesis of Medium and Large Ring *cis*- and *trans*-2-Aminocyclanols. IX. Thermal Degradation of Quaternary Bases of Some Medium and Large Ring *cis*- and *trans*-2-Aminoalcohols. Configuration Assignment. X. The Effect of Ring Size and Configuration on the Basicity of the 2-Aminocyclanols. (*In Czech.*) Stereochemické studie. VIII. Synthesa *cis*- a trans-2-aminocyklanolů se středními a velkými kruhy. IX. Hofmannovo odbouravani kvarternich basi nekterych 2-aminocyklanolu se strednimi a velkymi kruhy. Prisouzeni konfigurace aminocyklanolum. ***Miroslav Svoboda and Jiří Cicher.*** X. Vliv konfigurace a velikosti kruhu na disociační konstanty-2-aminocyklanolů. ***Miroslav Svoboda, Jiří Jonás, and Jiří Cicher.*** *Chemické Listy*, v. 52, no. 8, Aug. 1958, p. 1560-1602.

254* Synthesis of Hydroxy-Butyl-Anthraquinones. 1,2,4,5-Tetrahydroxy-2-butyl anthraquinone and other hydroxy-butyl anthraquinones unknown until now were compared spectroscopically. Improvement of analytical and preparatory partition chromatography by means of new solvent systems is discussed. (*In German.*) Synthese von Hydroxy-butyl-anthrachinonen. ***Hans Brockmann and Werner Müller.*** *Chemische Berichte*, v. 91, no. 9, 1958, p. 1920-1935.

255* Prototropic Rearrangement of Acetylene-β-Ethylene Alcohols and of Allyl Acetylene Carbides. Using methanol soda to treat acetylene-β-ethylene alcohols and allyacetylenes having a true acetylene function is a simple and practical method to obtain satisfactory yields of alcohols and carbides. (*In French.*) Réarrangement prototropique des alcools acétyléniques-β-éthyléniques et des carbures allylacétyléniques. ***Marcel Bertrand.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences,* v. 247, no. 11, Sept. 15, 1958, p. 824-827.

256* A Contribution to the Study of the Physico-Chemical Properties of N-Eicosanoic and of N-Docosanoic. Deals with the crystalline structure in the pure state or in binary mixture with other fatty acids; dilatometry; solidification point of binary and ternary mixtures with other fatty acids; vapor tensions indices of refraction; densities; surface tension; viscosity; solubility. (*In French.*) Contribution a l'étude des propriétés physico-chimiques du n-eicosanoique et du n-docosanoique. ***Albert Daguerre.*** *Journal des Recherches du Centre National de la Recherche Scientifique,* no. 41, Dec. 1957, p. 273-307 + 1 plate.

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258 A Study of the Alkylation of 2-Phenylbutanenitrile With Butyl Chlorides. 2-Phenylbutanenitrile was alkylated with the butyl chlorides, using both $NaNH_2$ and NaH as condensing agents. The "arylation" and alkylation of propionitrile was also investigated. ***Gordon L. Goerner and Andrew A. Holzschuh.*** *Journal of Organic Chemistry,* v. 23, Sept. 1958, p. 1346-1351.

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261* Preparing Detergent From Olefins. Secondary alkylsulfates containing CO and H_2 are synthesized over various catalysts. Gives optimum sulfating conditions. (*In Russian.*) Poluchenie moiushchikh veshchestv iz olefinov. ***E. M. Kheifets, et al.*** *Khimiia i Tekhnologiia, Topliv i Masel,* v. 3, no. 9, Sept. 1958, p. 48-54.

262 Synthesis and Structure of 2,6-Dihalo-Benzenone-Indophenylacetate and Benzenone-Indo-3',5'-Dihalo-Phenylacetate. ***C. de Borst, F. N. Hooge, and G. J. Arkenbout.*** *Nature,* v. 182, Oct. 11, 1958, p. 1017-1018.

263* The Chemistry of Naturally Occurring Furans. II. Sesquiterpenoids; diterpenoids; higher terpenoids; biogenesis of the terpenoid furans. ***J. Levisalles.*** *Perfumery and Essential Oil Record,* v. 49, Oct. 1958, p. 627-635.

264* Chemistry of Acetylenic Ethers. XXXI. A Simplified Procedure for the Preparation of Ethyl β-Chlorovinyl Ether. XXXII. Formation of 1,3-Dialkyl-2-ethoxy-*cyclo*but-2-ene-4-ones From Ethyl 1-Alkynyl Ethers. Ethyl β-chlorovinyl ether can be obtained from chloroacetaldehyde diethylacetal by heating with potassium pyrosulfate. On heating, ethylene is eliminated from an ethyl 1-alkynyl ether; the product formed in good yield is a 1,3-dialkyl-2-ethoxy-*cyclo*but-2-ene-4-one. XXXI. ***J. F. Arens, J. Vegter, and T. De Boer.*** *XXXII.* ***J. Nieuwenhuis and J. F. Arens.*** *Recueil des Travaux Chimiques des Pays-Bas,* v. 77, no. 8, Aug. 1958, p. 753-768.

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266* Main Approaches to the Commercially Used Dinitriles. Some methods of preparing several saturated and unsaturated aliphatic dinitriles and other commercially important dinitriles. (*In French.*) Principales voies d'accès aux dinitriles utilisés dans l'industrie. ***J. Phelisse.*** *Société Chimique de France, Bulletin,* 1958, nos. 8-9, Aug.-Sept., p. 1069-1073.

267* Synthesis of Benzofuran Derivatives. II. A New Synthesis of Visnagin. ***R. Aneja, S. K. Mukerjee, and T. R. Seshadri.*** *Tetrahedron,* v. 3, no's. 3/4, Aug.-Sept. 1958, p. 230-235.

268* Naphthaquinones I. The Molecular Structures of Some Halogeno-2:7-dihydroxynaphthalenes. Some new substituted naphthaquinones have been prepared by the oxidation of derivatives of 2,7-dimethoxynaphthalene with chromic acid. It is now concluded that monobromination of 2,7-dihydroxynaphthalene gives the 1-bromo derivative and that dibromination and dichlorination furnish the 1,6-dibromo and 1,6-dichloro compounds. ***R. D. Wilson.*** *Tetrahedron,* v. 3, no's. 3/4, Aug.-Sept. 1958, p. 236-242.

269* Fundamental Reactions to Explain the Brown Coloring of Food Articles. In many cases, the phenomenon can be explained by a mutual reaction pattern characteristic with condensation between aldehyde groups of sugars and free amino groups. Sugar is subjected to changes producing brown-colored compounds. Hypotheses, tests, consequences in alimentation, and prevention methods are considered. (*In Norwegian.*) Grunnleggende reaksjoner for brunfarving av naeringsmidler. ***Ole G. Devik.*** *Tidsskrift for Kjemi, Bergvesen og Metallurgi,* v. 18, no. 7, 1958, p. 106-109.

270 General Properties of Low-Temperature Tar. Summarizes the general knowledge of low-temperature tar and traces the character of coal tar from incipient formation, through the condensation of the tar vapors, to the subsequent alteration of tar products resulting from further heating. The relationship of the carbonizing conditions and of the coal to the yield and properties of the tar produced is discussed. ***Manuel Gomez, John B. Goodman, and V. F. Parry.*** *U. S. Bureau of Mines Bulletin* 569, 1958, 31 pp. (TN21 Un3b Vis.)

See also: **673** (detergents glossary).

CHEMISTRY—PHYSICAL

271 Phase Relations of Binary Systems That Form Azeotropes. I. The Ammonia-*n*-Butane System. II. The Ammonia-Isooctane System. I. ***Webster B. Kay and Herbert A. Fisch.*** II. ***Webster B. Kay and F. Morgan Warzel.*** *A.I.Ch.E. Journal,* v. 4, no. 3, Sept. 1958, p. 293-299.

272 Critical Temperatures and Pressures of Hydrocarbons. A method has been developed for the calculation of van der Waals' constants with which critical temperatures and pressures can be calculated directly. ***J. Charles Forman and George Thodos.*** *A.I.Ch.E. Journal,* v. 4, no. 3, Sept. 1958, p. 356-361.

273* The Solubility of Nitrogen, Argon and Ethane in Alcohols and Water. ***J. Chr. Gjaldbaek and H. Niemann.*** *Acta Chemica Scandinavica,* v. 12, no. 5, 1958, p. 1015-1023.

274* The Role of Ozone in Initiating Oxidation of Saturated Gaseous Hydrocarbons. Oxidation of propane and H_2 by O_2 formed by the decomposition of ozone (at 85 C up). (*In Russian.*) K voprosu o roli azona v initsiirovanii reaktsiĭ okisleniia nasyshchenykh gazoobraznykh uglevodorodov. ***N. A. Kleimenov and A. B. Nalbandian.*** *Akademiia Nauk SSSR, Doklady,* v. 122, no. 1, Sept. 1, 1958, p. 103-105.

275* Properties and Structure of NiO-Al_2O_3-Catalysts. III. Investigation of Relationships Between Composition, Mag-

netic Properties and Activity. Determination of magnetic susceptibility, its variation with temperature changes, magnetic moments, and Weiss constant of NiO-Al_2O_3-catalysts (with NiO content up to 59 mol. %) precipitated during heat treatment at 400, 600, and 750 C. (*In Russian.*) Svoĭstva i struktura NiO-Al_2O_3-katalizatorov. III. Issledovanie sootnosheniĭ mezhdu sostavom, magnitnymi svoĭstvami i aktivnost'iu. ***A. M. Rubinshtein and A. A. Slinkin.*** *Akademiia Nauk SSSR, Izvestiia, Otdelenie Khimicheskikh Nauk*, 1958, no. 9, Sept., p. 1054-1060.

276 Solid Phase Transitions in the UO_2-ZrO_2 System. Concludes that at 2300 C, the UO_2-ZrO_2 system consists of a homogeneous phase extending from 0 to 100 mole % ZrO_2. ***Gerard M. Wolten.*** *American Chemical Society, Journal*, v. 80, Sept. 20, 1958, p. 4772-4775.

277 The Heats of Formation at 25° of the Crystalline Hydrides and Deuterides and Aqueous Hydroxides of Lithium, Sodium and Potassium. ***Stuart R. Gunn and LeRoy G. Green.*** *American Chemical Society, Journal*, v. 80, Sept. 30, 1958, p. 4782-4786.

278 The Acid Dissociation Constants of Diethylenetriaminepentaacetic Acid and the Stability Constants of Some of Its Metal Chelates. The acid dissociation constants of diethylenetriaminepentaacetic acid, H_5Y, and the stability constants of its chelates with Mg^{+2}, Ca^{+2}, Sr^{+2}, Ba^{+2}, Mn^{+2}, Fe^{+2}, Co^{+2}, Ni^{+2}, Cu^{+2}, Zn^{+2}, and Cd^{+2} were determined at 20 C and on ionic strength of 0.10. ***Edward J. Durham and Daniel P. Ryskiewich.*** *American Chemical Society, Journal*, v. 80, Sept. 20, 1958, p. 4812-4817.

279 Rates of Solovolysis of Substituted Phenyldimethylcarbinyl Chlorides in Methyl, Ethyl, and Isopropyl Alcohols. Influence of the Solvent on the Value of the Electrophilic Substituent Constant. Rates of solvolysis at 25 C were determined for a number of representative substituted *t*-cumyl chlorides. ***Y. Okamoto, T. Inukai, and Herbert C. Brown.*** *American Chemical Society, Journal*, v. 80, Sept. 20, 1958, p. 4972-4976.

280 Solvent Effects in the Reactions of Free Radicals and Atoms. II. Effects of Solvents on the Position of Attack of Chlorine Atoms Upon 2,3-Dimethylbutane, Isobutane, and 2-Deuterio-2-methylpropane. III. Effects of Solvents in the Competitive Photochlorination of Hydrocarbons and Their Derivatives. IV. Effect of Aromatic Solvents in Sulfuryl Chloride Chlorinations. ***Glen A. Russell.*** *American Chemical Society, Journal*, v. 80, Sept. 20, 1958, p. 4987-5003.

281 The Zirconium-Hydrogen System: Some Thermodynamic Properties From a Heat Content Study. ***Thomas B. Douglas.*** *American Chemical Society, Journal*, v. 80, Oct. 5, 1958, p. 5040-5046.

282 The Kinetics of the Vapor Phase Photochlorination of Trifluorochlorethylene. The rate of the vapor phase chlorination of $CF_2 = CFCl$ was studied at room temperature and was found to depend on the 3/2 power of the Cl pressure when the latter is low. The rate depends on the square root of the light intensity. ***D. L. Bunbury, J. R. Lacher, and J. D. Park.*** *American Chemical Society, Journal*, v. 80, Oct. 5, 1958, p. 5104-5107.

283 Kinetics of the Thermal Reactions of Ethylene. Ethylene was pyrolyzed at temperatures from 480-582 C and at pressures from 0.9 to 13.7 cm. Analyses of the reaction products were made at intervals. Possible processes are discussed. ***George Dahlgren, Jr. and John E. Douglas.*** *American Chemical Society, Journal*, v. 80, Oct. 5, 1958, p. 5108-5110.

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285* Studies on the Transformation and Degradation of Sialic Acids in Aqueous Solution. Sialic acids, heated in aqueous solution of different pH, shows a stability maximum at pH 4 to 5. At more acid or alkaline conditions they are degraded by comparatively mild treatment, as demonstrated by ultraviolet and chromatographic examination. One of the alkali degradation products, 2-carboxypyrrole, was isolated and identified by X-ray analysis. ***Ingemar Berggard and Lars Odin.*** *Arkin för Kemi*, v. 12, no. 6, 1958, p. 581-595.

286* The Kinetics of the Pyrolysis of Cyclohexyl Chloride. Cyclohexyl chloride decomposes in the gas phase at 318-385 C almost exclusively to cyclohexene and HCl. ***E. S. Swinbourne.*** *Australian Journal of Chemistry*, v. 2, no. 3, Aug. 1958, p. 314-330.

287 The Kinetics of Molecular Sieve Action. Sorption of Nitrogen-Methane Mixtures by Linde Molecular Sieve 4A. Illustrates "partial molecular sieve action". Methane has a higher affinity for the sorbent and hence is preferentially sorbed at equilibrium, while N diffuses through the crystal more rapidly and thus is preferentially taken up during the early stages of sorption. ***H. W. Habgood.*** *Canadian Journal of Chemistry*, v. 36, Oct. 1958, p. 1384-1397.

288 Potential Purine Antagonists. X. Purines and Pyrazolopyrimidines: Comparisons of Ionisation. Ionization constants of 55 pyrazolopyrimidines were measured, and are compared with the published values for some purines. Differences in basicity, and in acidity, between similarly substituted representatives of these isomeric ring systems are discussed and interpreted. An apparent relation between anti-tumor activity and basic strength is noted for a series of amino-substituted pyrazolo(5',4'-4,5)-pyrimidines. ***B. M. Lynch, R. K. Robins, and C. C. Cheng.*** *Chemical Society, Journal*, 1958, Sept., p. 2973-2981.

289 The Titration and the Apparent Dissociation Constants of Weak Acids in Mixed Aqueous Solvents. The effect of acetone, ethanol, dioxan, and formaldehyde on the pH-titration curves of weak acids in aqueous solution is recorded. ***M. K. Hargreaves and P. J. Richardson.*** *Chemical Society, Journal*, 1958, Sept., p. 3111-3116.

290* A Contribution to the Study of Propane-Disulfonic Acid-(1,3)-Anhydride. II. Vibration Spectrum of Anhydride and of Some Derivatives of Disulfonic Acid. (*In German.*) Zur Kenntnis des Propan-disulfonsäure-(1.3)-anhydrids. II. Über das Schwingungsspektrum des Anhydrids und einiger Derivate der Disulfonsäure. ***Gerhard Geiseler and Rudolf Kuschmiers.*** *Chemische Berichte*, v. 91, no. 9, 1958, p. 1881-1891.

291* A Study of the Hydrogenation of Acetone Into Isopropyl Alcohol and of the Dehydrogenation of Isopropyl Alcohol Into Acetone. Reaction rate equations were formulated for the vapor-phase catalytic hydrogenation of acetone and the dehydrogenation of isopropyl alcohol inside the temperature range in which these reactions are reversible. (*In French.*) Étude de l'hydrogénation de l'acétone en alcool isopropylique et de déshydrogénation de l'alcool isopropylique en acétone. ***Stanislas Ciborowski.*** *Chimie & Industrie*, v. 80, no. 3, Sept. 1958, p. 240-247.

292 Some Observations on the Effect of the Interaction of Tantalum With Oxygen, Nitrogen, and Hydrogen. The { 100 } is shown to be the habit plane of the segregation of the reaction products which appear to be Ta_2O_5, TaN, and β TaH, respectively. ***R. Bakish.*** *Electrochemical Society, Journal*, v. 105, Oct. 1958, p. 574-576.

293 Reaction of Hydrogen With Uranium. The basic premises of kinetic studies were reviewed and the variation of reaction rates with temperature of certain compositions of uranium hydride was determined. Constants for interpolated pressure equations are given. ***W. M. Albrecht and M. W. Mallett.*** *Electrochemical Society, Journal*, v. 105, Oct. 1958, p. 610-611.

294 Vapour Pressures of Phenol and the Cresols. The vapor pressures of phenol, *o*-, *m*-, and *p*-cresol were measured over the temperature ranges 0-40 C and 110-200 C. The results were fitted to two-constant equations, $\log_{10} P = A - B/(t+273)$ for the lower temperature range and to Antoine equations, $\log_{10} P = A - B/(t+C)$ for the higher range. ***D. P. Biddiscombe and J. F. Martin.*** *Faraday Society, Transactions*, v. 54, Sept. 1958, p. 1316-1322.

295 The Properties of Ionized Monolayers. I. Sodium Dodecyl Sulphate at the Air/Water Interface. II. The Thermodynamics of the Ionic Double Layer of Sodium Dodecyl Sulphate. III. The Thermodynamics of the Ionic Double Layer of Sodium Octanoate. ***E. Matijević and B. A. Pethica.*** *Faraday Society, Transactions,* v. 54, Sept. 1958, p. 1382-1407.

296 A Study on the Isotope Effects in the Reduction of Carbon Dioxide by Zinc. Shows that in the case of irreversible surface reactions, Bernstein's equation which permits the calculation of the fractionation factor is still valid. Experimental factors are in good agreement with those obtained by calculating the partition functions of the adsorbed activated complexes. (*In French.*) Étude des effets isotopiques dans la réduction du gaz carbonique par le zinc. ***Marjan Senegačnik.*** *France, Commissariat a l'Énergie Atomique, Rapport CEA No.* 726, 1957, 82 pp. (QC770 F84.2r Contin.)

297* Polarographic Behaviour of Organic Iodocompounds. II. Iodonaphthalene. The polarographic behavior of 2-iodonaphthalene was studied in aqueous mixtures of ethanol, dioxane, and acetone containing 1 M $LiCl_2$. ***C. S. Ramanathan and R. S. Subrahmanya.*** *Indian Academy of Sciences, Proceedings,* v. 48, sec. A, no. 2, Aug. 1958, p. 62-68 + 1 plate.

298* A Method of Calculating the Heats of Combustion of Organic Compounds. Simple equations are based on the number of O atoms necessary to burn the compound to CO_2 and H_2O. ***Arlo Moffat and Herschel Hunt.*** *Indiana Academy of Science, Proceedings,* v. 67, 1957, p. 122-127.

299 Selective Melting of Frozen Solutions With Radio-Frequency Power. Dielectric heating gives new separation process for heat-sensitive materials. ***Charles G. Heisig and Kenneth A. Kobe.*** *Industrial and Engineering Chemistry,* v. 50, Oct. 1958, p. 1517-1524.

300 Thermal Conductivity of Graphite-Silicone Oil and Graphite-Water Suspensions. ***T. B. Jefferson, O. W. Witzell, and W. L. Sibbitt.*** *Industrial and Engineering Chemistry,* v. 50, Oct. 1958, p. 1589-1592.

301 The Fischer-Tropsch Synthesis With Iron Catalysts. The Effect of Reaction Temperature on Product Composition. Chromatographic methods of analysis have been used to investigate the effect of reaction temperature on the composition of the products. With increase in temperature over the range 200-300 C the mean mol.wt. of the product falls and the proportion of O compounds decreases in favor of olefinic and aromatic hydrocarbons. ***D. Gall and P. J. Kipping.*** *Institute of Petroleum, Journal,* v. 44, Aug. 1958, p. 243-252.

302 Some Factors Affecting the Activity of Sintered Iron Catalysts for the Fischer-Tropsch Synthesis. The activity of catalysts prepared by sintering alkali-impregnated mill scale increases with reduction in mean particle size over the range 10-50 B.S. sieve sizes. It is also increased by lowering the temperature of reduction in H from 450 C and by prolonged extraction with water. ***T. A. Dorling, D. Gall, and C. C. Hall.*** *Journal of Applied Chemistry,* v. 8, Sept. 1958, p. 533-549.

303 Physical Factors Affecting the Absorption of Oxygen by Thin Films of Bituminous Road Binders. Physical conditions affecting the reaction of O with thin films of tars and bitumens at temperatures normally encountered on the road were studied. Reactions in the dark and in the presence of light were investigated and the interdependence of the two kinds of reaction evaluated. ***E. J. Dickinson, J. H. Nicholas, and S. Boas-Traube.*** *Journal of Applied Chemistry,* v. 8, Oct. 1958, p. 673-687.

304 Vibrational Spectrum and Structure of Metal-Cyanide Complexes in the Solid State. IV. $K_3Cu(CN)_4$. ***Llewellyn H. Jones.*** *Journal of Chemical Physics,* v. 29, Sept. 1958, p. 463-466.

305 Infrared Emissivity of NO in High-Temperature Air. The emissivity treatment developed by Mayer was modified for specific application to rotation-vibration spectra. The emissivity of an equilibrium distribution of NO in high-temperature air was calculated for one layer thickness and several values of temperature and pressure. ***R. G. Breene, Jr.*** *Journal of Chemical Physics,* v. 29, Sept. 1958, p. 512-516.

306 Microwave Studies of the Structure of Cyclopropyl Derivatives. The microwave spectra of cyclopropyl chloride and cyclopropyl cyanide were studied and rotational constants for the Cl^{35} and Cl^{37} molecules of the chloride and for the normal molecule and two deuterated species of the cyanide were determined. ***James P. Friend and B. P. Dailey.*** *Journal of Chemical Physics,* v. 29, Sept. 1958, p. 577-582.

307 Structure of Liquid Germanium Dioxide. Viscosity and electric conductivity measurements were made on liquid GeO_2 from 1250-1550 C. A mechanism for viscous flow is postulated. ***J. D. Mackenzie.*** *Journal of Chemical Physics,* v. 29, Sept. 1958, p. 605-607.

308 Study of the Compressions of Several High Molecular Weight Hydrocarbons. Isothermal compressions were measured for 13 high-purity liquid hydrocarbons having a molecular weight range of 170 to 351 and two binary mixtures of liquid hydrocarbons. The pressure range for these measurements was from atmospheric to 10,000 bars. The volume changes due to pressure were measured at six temperatures spaced about equally in the range 37.8 to 135.0 C. ***W. G. Cutler, R. H. McMickle, W. Webb, and R. W. Schiessler.*** *Journal of Chemical Physics,* v. 29, Oct. 1958, p. 727-740.

309 Reaction of Methyl Radicals With Ethylene. The gas phase reaction was studied between 124 and 159 by the thermal decomposition of di-*t*-butyl peroxide in presence of ethylene. ***R. K. Brinton.*** *Journal of Chemical Physics,* v. 29, Oct. 1958, p. 781-786.

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311 Crystal Structure of Copper Fluoride Dihydrate, $CuF_2 \cdot 2H_2O$. The crystal structure was determined from single crystal X-ray data. The morphology and optic axes were investigated. ***S. Geller and W. L. Bond.*** *Journal of Chemical Physics,* v. 29, Oct. 1958, p. 925-930.

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320* Free Hydrocarbon Radicals. I. Their Reactions in the Gas Phase. The free radical reactions in the gas phase have progressed from an isolated item of interest to a major tool of the research workers. This article attempts to assess the present position in the field. ***A. F. Trotman-Dickenson.*** *Petroleum*, v. 21, Oct. 1958, p. 371-374.

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326* Quantitative Kinetics in Heterogeneous Catalysis. Dehydrogenation of Secondary Alcohols on Nickel. Dehydrogenation, catalyzed by Raney nickel, of a number of secondary alcohols in the presence of their reaction products, extraneous ketones, and different solvents or inhibitors. (*In French.*) La cinétique quantitative en catalyse héterogène. La déshydrogénation des alcools secondaires sur le nickel. ***François Claes and Joseph C. Jungers.*** *Société Chimique de France, Bulletin*, 1958, nos. 8-9, Aug.-Sept., p. 1167-1174.

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334* The Effect of the Medium on Ion Exchange Adsorption. The Dependence of the Exchange Constant on the Dielectric Constant of the Solvent. (*In Russian.*) Vliianie sredy na ionoobmennuiu adsorbtsiiu. Zavisimost' konstanty obmena ot dielektricheskoi postoiannoi rastvoritelia. ***A. T. Davydov and R. F. Skoblionok.*** *Zhurnal Fizicheskoi Khimii*, v. 32, no. 8, Aug. 1958, p. 1703-1710.

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ing compounds. The conditional spectra of the latter are obtained as simple combinations of the corresponding frequencies of the spectra of simpler initial compounds. (*In Russian.*) Metod rascheta termodinamicheskikh svoistv nekotorykh soedinenii bez znaniia ikh kolebatel'nykh spektrov. ***Iu. Maslov and P. G. Maslov.*** *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 8, Aug. 1958, p. 1715-1725.

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COATINGS

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355 Protective Coatings for Steel. I. The types of coatings are classified and characteristics of specific materials in each category are related to present applications. Types of finishing systems and methods of paint application complete this summary of modern developments in a field of tremendous scope. ***Louis J. Nowacki and E. R. Mueller.*** *Industrial Heating*, v. 25, Sept. 1958, p. 1810 + 4 pages.

356* Mechanized Valve Surfacing With the Oxy-Acetylene Flame. Porosity, cracking and rough surfaces were eliminated when a mechanized surfacing set-up replaced a manual one. ***J. F. Barnes.*** *Industry & Welding*, v. 31, Oct. 1958, p. 81 + 2 pages.

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360 The Painting of Aluminium and Its Alloys. Where a painted finish is the primary requirement of a particular product, the main advantage of Al as a substrate lies in the long paint-life obtained and the reduction in the cost of paint maintenance. ***F. A. Champion.*** *Oil & Colour Chemists' Association, Journal*, v. 41, Oct. 1958, p. 730-749.

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363 Aluminium: Versatile Pigment. I. As a component of finishing coats and printing inks, the remarkable leafing property of suitably prepared Al pigment is the key to its usefulness. *Paint Manufacture*, v. 28, Oct. 1958, p. 319-321.

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365* Lacquers and Varnishes for the Converter. II. Lacquer and varnish paper coatngs possess definite functional advantages to make a substrate moisture vapor proof, heat sealable, and more presentable. ***Warren C. Ashley.*** *Paper, Film and Foil Converter*, v. 32, Oct. 1958, p. 37 + 3 pages.

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See also: **13** (coatings for light metal aircraft parts); **167** ketones in lacquer solvents); **426** (Al, Al-Si cladding on Mo); **432** (electroplated Fe on Nb); **505** (impurity centers in semiconductors); **730** (protective coatings for Mo).

CONTROL SYSTEMS, COMPUTERS, AND SYSTEMS ENGINEERING

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376* About Noise Stability of Pulse-Frequency Telemetering. Analysis of means of signal discretion. Assumption of mean error and mean-square error as criteria. Deduction of calculation formulae for evaluation. (*In Russian.*) O pomekhoustoĭchivosti chastotno-impul'snogo teleizmereniia. ***N. V. Pozin.*** *Avtomatika i Telemekhanika*, v. 19, no. 10, Oct. 1958, p. 968-976.

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396* A Simplified Theory of Feedback Control Systems. V. Part 5 of an educational series of articles on control systems. ***P. Naslin.*** *Process Control and Automation*, v. 5, Oct. 1958, p. 408-411.

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398* The Siemens 2002 Digital Computer. *Hans Kaufmann.* *Siemens Review*, v. 25, no. 4, 1958, p. 148-153.

399 Analog Computing Equipment for Analysis of Neutron Cross-Section Data. Describes components and associated equipment; procedure for curve-fitting, area analysis, resolution functions, and multilevel calculations. ***R. W. Hockenbury, C. R. Pierce, and M. L. Yeater.*** *U. S. Atomic Energy Commission, KAPL-1651*, Mar. 7, 1958, 21 pp. (UF767 Un3.1ka Contin.)

See also: **681** (pneumatic computations); **720** (telecontrol of gas engine compressors); **779** (conveyor system in foundry); **1006** (training systems engineers).

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400 An Experimental Switching System Using New Electronic Techniques. These techniques include use of a stored program, a network employing gas tube crosspoints, time-division common control and large-capacity barrier grid tube, and photographic storage systems. ***A. E. Joel, Jr.*** *Bell System Technical Journal*, v. 37, no. 5, Sept. 1958, p. 1091-1124.

401 Semiconductor Circuit Design Philosophy for the Central Control of an Electronic Switching System. Primary emphasis in the designs has been low cost consistent with good margins, reliability, and the meeting of systems requirements. ***B. J. Yokelson, W. B. Cagle, and M. D. Underwood.*** *Bell System Technical Journal*, v. 37, no. 5, Sept. 1958, p. 1125-1160.

402 Fundamental Concepts in the Design of the Flying Spot Store. Parallel optical channels are used to provide high capacity and parallel readout. A feedback system provides rapid and precise beam positioning for writing and readout. This paper stresses physical realizability, speed, capacity, and other system features. The characteristics of a laboratory model are presented. ***C. W. Hoover, Jr., R. E. Staehler, and R. W. Ketchledge.*** *Bell System Technical Journal*, v. 37, no. 5, Sept. 1958, p. 1161-1194.

403 Factors Affecting the Use of Over-the-Horizon Links in Telecommunication Networks. An evaluation of the scatter link with respect to its compatibility with existing communication facilities, and surrounding facets of the social technology and economic structure. ***Charles A. Parry.*** *Communication and Electronics*, 1958, no. 38, Sept., p. 485-496.

404 Simplicity in 3-Phase System Circuit Conventions and Concepts. II. Polyphase generators and synchronous machine analysis. ***W. A. Lewis.*** *Electrical Engineering*, v. 77, Nov. 1958, p. 1038-1040.

405 Electrical Engineering Practice. Definitions, materials, measurements; generation and sale of electrical energy; transmission and control, including switchgear and circuit protection. ***J. W. Meares and R. E. Neale.*** v. I, 6th Rev. Ed. 716 pp. 1958. Chapman & Hall Ltd., London. (TK145 M46e6)

406 International Developments in Insulation Standards. Activities of the Technical Committee on Electrical Insulation at 1958 International Electrotechnical Commission meetings highlight new test procedures, including measurement of dielectric constant, dielectric loss, and thermal stability of magnet wire. ***J. F. Dexter.*** *Electrical Manufacturing*, v. 62, Oct. 1958, p. 76-79.

407 Fast Response Marks All-Transistor Regulator. A closed-loop system for the voltage regulation of an a-c generator derives numerous advantages from the exclusive use of solid state components. A complete functional circuit analysis reveals the multiple key roles played by transistors and diodes in this highly efficient and compact regulator. ***Baruch Berman.*** *Electrical Manufacturing*, v. 62, Oct. 1958, p. 82-85.

408 Gaseous Dielectric Materials—Applications and Test Methods. The range of equipment applications for gaseous (dry) dielectrics, including transformers, airborne electronics and radar, has been widened owing to the development of new electronegative gases with increased breakdown voltage characteristics and the availability of improved test cells and test methods. ***M. L. Manning and E. D. Padgett.*** *Electrical Manufacturing*, v. 62, Oct. 1958, p. 86-90.

409* Develop Economical Designs. Larger substations, heavy-duty feeders with large conductors and higher voltages, larger distribution transformers, and larger secondary conductors are characteristics of economical design in the modern distribution system. *Electrical World*, v. 150, Oct. 20, 1958, p. 90-91.

410* Relation Between Accuracy Class and Overcurrent Characteristic of a Current Transformer. Accuracies of the current transformer in both ranges are linked by relations given on the one hand by the material of the core and on the other hand by the characteristical design data. (*In Czech.*) Vztah mezi třídou přesnosti a nadproudovou charakteristikou měřiciho transformátoru proudu. ***Jan Kopeček.*** *Elektrotechnický Obzor*, v. 47, no. 9, Sept. 1958, p. 456-459.

411* Inspection of Contact Connections by Semiconductor Thermoresistance. Description of a simple, but very sensitive instrument for measuring surface temperature of current carrying parts of electrical equipment with semiconductor thermoresistance. (*In Russian.*) Kontrol' kontaktnykh soedinenii poluprovodnikovym termosoprotivleniem. ***I. V. Gol'dberg.*** *Energetik*, v. 6, no. 9, Sept. 1958, p. 26-27.

412 Electrical Vector-Loci Display Apparatus. Describes an apparatus for the display of loci and illustrates some of the forms obtained. ***P. Strange.*** *Engineering*, v. 186, Sept. 12, 1958, p. 354-356.

413* Design of 230 kv. Transmission Lines. One of several articles in this journal describing the St. Lawrence power project. ***N. J. McMurtrie.*** *Engineering Journal*, v. 41, Sept. 1958, p. 94-96.

414 The Mechanism of Degradation of Titanate Dielectrics. An interpretation of the mechanism of degradation is given, based on the production of color centers. ***A. Koller and Z. Pospisil.*** *Engineers' Digest*. v. 19, Sept. 1958, p. 404-406. (Translated from *Czechoslovak Journal of Physics*. v. 8, no. 3, 1958, p. 315-321.)

415 Dielectric Slow-Wave Structures for the Generation of Power at Millimeter and Submillimeter Wavelengths. Several new types of coupling structures, designed to extract energy from a megavolt electron beam at a harmonic of the frequency used to modulate the beam current, are considered. The advantages of a slow-wave device over a right cylindrical cavity are indicated. ***R. H. Pantell, P. D. Coleman, and R. C. Becker.*** *IRE Transactions on Electron Devices*, v. ED-5, no. 3, July 1958, p. 167-173. (TK1 In6.6ed Vis.)

416 Utilization of Component Part Reliability Information in Circuit Design. This paper discusses techniques for optimizing circuit reliability by application of component characteristic data obtained from reliability testing. ***M. A. Xavier, L. L. Schneider, and P. Gottfried.*** *IRE Transactions on Reliability and Quality Control, PCRQC-14*, Sept. 1958, p. 60-68. (TK1 In6.6q Vis.)

417* A Simplified Electromagnetic Theory of the Induction Motor, Using the Concept of Wave Impedance. Electromagnetic field theory is applied to the analysis of performance of an induction-motor rotor when it is exposed to a rotating magnetic field of constant amplitude. ***A. L. Cullen, and T. H. Barton.*** *Institution of Electrical Engineers, Proceedings*, v. 105, pt. C, no. 8, Sept. 1958, p. 331-336.

418* Combined Utilization of Semiconductor Devices and Ferrites With Rectangular Hysteresis Loop in Commutation Impulse Circuits. (*In Russian.*) Sovmestnoe primenenie poluprovodnikovykh priborov i ferritov s priamougol'noĭ petlei gisterezisa v kommutatsionnykh impul'snykh skhemakh. ***E. A. Demin and L. A. Chinenkov.*** *Izvestiia Vysshikh Uchebnykh Zavedenii, Radiotekhnika*, 1958, no. 3, May-June, p. 314-318.

419* Uniform Transient Error. Equations describing error in power-level measurements of transients can be used to compute the design of analyzers so as to distribute transient error in a way compatible with experimental requirements. Consideration of a limiting power-discrimination factor provides a measure of the largest number of bandpass filters that can be overlapped on adjacent channels to yield meaningful information about a rapidly changing signal. ***Edith L. R. Corliss.*** *Journal of Research, National Bureau of Standards*, v. 61, no. 1, July 1958, p. 25-30.

420 Network Synthesis. Textbook. Comprehensive treatment of ideas used in the synthesis of two-terminal networks. ***David F. Tuttle, Jr.,*** v. I. 1175 pp. 1958. John Wiley & Sons, New York. (TK3226 T88n)

421* A Circuit for Measuring Weak Signals With Continuous Spectrum. Description of the circuit excluding effect of internal noises of equipment and instability of amplification. Principal basis of the circuit, its description, and results of experimental checking. (*In Russian.*) Skhema dlia izmereniia slabykh signalov so sploshnym spektrom. ***V. S. Voiutskiĭ and A. I. Slutskovskiĭ.*** *Radiotekhnika*, v. 13, no. 9, Sept. 1958, p. 25-29.

422* Silicon for the Construction of Power Rectifiers. ***Eberhard Spenke.*** *Siemens Review*, v. 25, no. 4, 1958, p. 118-122.

423* The Technique of the Silicon Rectifier. ***Joachim Pfaffenberger.*** *Siemens Review*, v. 25, no. 4, 1958, p. 123-129.

424* Experience With Silicon Rectifiers. ***Hans Zenneck.*** *Siemens Review*, v. 25, no. 4, 1958, p. 129-135.

425* The Life of Contacts of Low-Voltage Switchgear for Frequent Operation. Details of the life of switchgear and switch contacts are given as well as the varying requirements of switching squirrel-cage motors. ***Hanns Horst Caemmerer.*** *Siemens Review*, v. 25, no. 5, 1958, p. 193-197.

See also: **374** (circuit breaker manufacture); **510** (generating plant modernization); **1081** (epoxide resins in electrical components); **1099** (dielectric properties of polymers).

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426 Bonding Materials for Making Contacts to p-Type Silicon. Molybdenum clad on one side with Al, or Al-Si eutectic, has been used to form structurally sound ohmic contacts to p-type Si, although a flux was necessary when the Al-Si eutectic-clad material was used. The desired Al-Si solid solution can be formed before a substantial amount of aluminum reacts with the Mo. The coefficients of thermal expansion are sufficiently well matched so that the Si wafer does not crack during fabrication, and only minimal alloy penetration into the Si is observed with the eutectic-clad material. ***Donald R. Mason and John C. Sarace.*** *Electrochemical Society, Journal*, v. 105, Oct. 1958, p. 594-598.

427 Electroplating and Electrorefining of Metals From the Sulphamate Bath. Greater application in the commercial plating of many metals and alloys of practical importance and in electroforming. ***T. L. Rama Char.*** *Electroplating and Metal Finishing*, v. 11, Oct. 1958, p. 343-346.

428* Electroplating Improves Properties of Iron Powder Articles. A study by Battelle Memorial Institute shows how electroplates behave when applied to Fe powder parts. Recommended plating baths for Cd, Zn, Ni, Cr, and Cu are presented. *Industrial Finishing (London)*, v. 10, Sept. 1958, p. 50 + 2 pages.

429* Cathode Polarization During Electro-Depositing Tin-Nickel Alloy. The presence of NaF and NH_4F stimulates the tin cathode potentials. The simultaneous depositing of Sn and Ni occurs under a higher positive potential, as the one of Sn and Ni separately. (*In Russian.*) Katodnaia poliarizatsiia pri elektroosazhdenii splava alovo-nikel'. ***N. T. Kudriavtsev and K. M. Tiutina.*** *Nauchnye Doklady Vysshei Shkoly, Khimiia i Tekhnologiia*, 1958, no. 3, p. 435-438.

430 Improved Electroplated Finishes for Zinc Die Castings. Reports on studies of electropolishing and electroplating procedures for reducing costs and improving corrosion resistance of die castings. ***W. H. Safranek and C. L. Faust.*** *Plating*, v. 45, Oct. 1958, p. 1027-1037.

431* Platinum-Coated Titanium Anodes. A thin layer of Pt applied to the surface of Ti provides an economic nonconsumable electrode, much higher current density limits in many types of electrolytes and lightness and better mechanical properties of Ti. *Platinum Metals Review*, v. 2, no. 4, Oct. 1958, p. 127.

432 Electroplated Metals on Niobium. Of the plated metals studied, Fe was well bonded to Nb. The fair as-plated adherence of Fe was improved by heat bonding. Baking, prior to heat bonding, prevented localized blistering during the subsequent heat treating. Iron plates formed a weak intermetallic alloy layer with the Nb that might be a satisfactory basis for subsequent cladding. Iron-coated Nb offers a surface that can be plated with other metals, soldered, or dip coated. ***John G. Beach.*** *Paper from* "Technology of Columbium (Niobium)", p. 81-86, 1958. John Wiley & Sons, New York. (TN799.N7 EL25t Over.)

433 Temperature Dependence of Tafel Slope in the Formation of Very Thin Anodic Oxide Films on Niobium. A kinetic study was made of the formation of very thin anodic oxide films on Nb at constant current over the temperature range −10 to 70 C. Values of the differential formation field are reported at current densities of 1000, 100, 10 and 1 $\mu a/cm^2$ at ten degree intervals over the temperature range studied. ***George B. Adams, Jr. and Timothy Kao.*** *U. S. Atomic Energy Commission, AECU-3769,* 1957, 10 pp. (UF767 U3au Contin.)

434 Anodic Behavior of Nickel. I. Effect of Components of Electrolyte. Studies the quantitative effects of the constituents of the electrolyte on the behavior of three Ni anodes. The anode potential and current density at which nickel became passive was found to be a reproducible value that increased with temperature. ***Nelson F. Murphy and Bharat C. Oza.*** *Virginia Polytechnic Institute, Bulletin, Engineering Experiment Station Series No.* 125, May 1958, 18 pp. (TN21 V81b Vis.)
See also: **820** (plastics in the plating shop).

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435 Aircraft Communications Systems. Details of modern British airborne radio communications equipment. Covers theoretical circuit descriptions and setting up and practical operating instructions. ***J. H. H. Grover.*** 127 pp. 1958. Philosophical Library, 15 E. 40th St., New York, N.Y. (TL695 G91a)

436* Couplers Between Wave-Guides. The Directional Narrow-Slot Coupler Theory. The author develops a new method of calculation, with a restriction to narrow-slot couplers. (*In French.*) Couplages entre guides d'ondes théorie des coupleurs directifs a fentes minces. ***G. Broussaud.*** *Annales de Radioélectricité,* v. 13, July 1958, p. 187-199.

437* Some Effects From Off-Centering the Cathode in the Magnetron. Off-centering has no effect on the capacity due to the interaction space, or, consequently, on the resonance frequency of the circuit. Conventional circular orbits of a centralized magnetron in static operation, are subject to distortions which, by means of a conformal transformation, can be calculated with a first degree of approximation. The graphical method traces point by point the electron trajectories in the absence of space charge. (*In French.*) Sur quelques effets d'un décentrage de cathode dans le magnétron. ***B. Vallatin.*** *Annales de Radioélectricité,* v. 13, July 1958, p. 224-229.

438* The Pumping of Vacuum Tubes. I. General Considerations. The purpose of this article is to answer certain questions, in particular, in respect to high power microwave tubes. (*In French.*) Sur le pompage des tubes a vide. I. Généralités. ***H. Huber and Monique Warnecke.*** *Annales de Radioélectricité,* v. 13, July 1958, p. 230-251.

439* The Finer Structure of Magnetic Tape: Microscope Studies. Sections of magnetic tape in three planes were prepared at two for four μ thickness. Section profiles of coatings are related to surface features and the behavior of polyester and acetate bases, in sectioning, was demonstrated. ***Reuben M. Cares.*** *Audio Engineering Society, Journal,* v. 6, no. 4, Oct. 1958, p. 225-233.

440 A High-Speed Barrier Grid Store. The memory uses a barrier grid type electrostatic storage tube which is incorporated in a complete general-purpose store with a capacity of 16,384 bits. Random access to any bit together with a full storage cycle of reading and writing is complete in 2.5 microseconds, permitting a 400-kc repetition rate. Experience with this store indicates that barrier grid storage can provide stable, compact, economical memory for data handling systems. ***T. S. Greenwood and R. E. Staehler.*** *Bell System Technical Journal,* v. 37, no. 5, Sept. 1958, p. 1195-1220.

441* Tropospheric Scatter System Evaluation. A chart is presented to enable performance and/or equipment parameters to be determined for a wide range of conditions. ***M. Telford.*** *British Institution of Radio Engineers, Journal,* v. 18, Sept. 1958, p. 511-523.

442* Design of Detector Stages for Signals With Symmetrical or Asymmetrical Sidebands. For asymmetrical-sideband signals (i.e. television signals), an improved design is possible using the results of recent investigations. ***A. van Weel.*** *British Institution of Radio Engineers, Journal,* v. 18, Sept. 1958, p. 525-538.

443* Application of Gas Discharge Tubes as Noise Sources in the 1700-2300 Mc/s Band. A minimum coupling of 15 db is maintained throughout the band. Satisfactory matching is obtained in both the struck and unstruck state, thus facilitating easy noise figure measurements with an accuracy of 0.2 db. ***M. Kollanyi.*** *British Institution of Radio Engineers, Journal,* v. 18, Sept. 1958, p. 541-548.

444* The Design and Performance of Magnetic Tape Recording Heads. Heads used for high quality sound recording and reproduction are discussed in detail. ***C. W. Ross.*** *British Institution of Radio Engineers, Journal,* v. 18, Sept. 1958, p. 551-560.

445 Energy Balance in Disk Seal Oscillators at Ultra-High Frequencies. Energy measurements were made on DET 22(CV 273) disk triode oscillators in the frequency range 500-2000 Mc/s. It was found that most of the input power from the d.c. supplies could be accounted for by the a.c. output power and the power dissipated at the electrodes, including the heating of the cathode coating by h.f. currents. ***M. R. Gavin and L. J. Herbst.*** *British Journal of Applied Physics,* v. 9, Sept. 1958, p. 377-380.

446 Core-Reset Functions in Magnetic-Amplifier Analysis. I. A Core-Reset Function. II. Determination of Amplifier Performance. ***G. C. Feth.*** *Communication and Electronics,* 1958, no. 38, Sept., p. 503-519.

447 Insertion Loss Filter Design Applied to Transistorized Carrier System. Presents a special case of a design based on the insertion loss method. ***T. Winkler.*** *Communication and Electronics,* 1958, no. 38, Sept., p. 519-524.

448* Amplification of Very Wide Frequency Bands. Quotation of basic requirements (absence of distortion, sufficiently high amplification factor, stability and low noise level) to wide band amplifiers. Systematism of the process of amplification of very wide (from 100 to 1000 MC) frequency bands. Comparison between cascade and chain amplification. (*In German.*) Die Verstärkung sehr breiter Frequenzbänder. ***Karl Heinz Fischer and Georg Daisenberger.*** *ETZ: Elektrotechnische Zeitschrift,* v. 79, Ausgabe A, no. 18, Sept. 11, 1958, p. 625-632.

449 Radar Interference to Microwave Communication Services. ***R. D. Campbell.*** *Electrical Engineering,* v. 77, Oct. 1958, p. 917-921.

450* Latching Counters. I. Development of Four-Phase Circuit. A new type of scaling circuit was evolved which offers increased reliability and an independence of rise time, the circuit being capable of operating at any frequency between about 500 kc/s and d.c. ***W. P. Anderson and N. A. Godel.*** *Electronic & Radio Engineer,* v. 35, Oct. 1958, p. 362-367.

451* Temperature Compensating Networks. An analytical design procedure is proposed, employing thermistors, for class-B push-pull transistor amplifiers. ***Haim D. Polishuk.*** *Electronic & Radio Engineer,* v. 35, Oct. 1958, p. 373-377.

452* Phase-Shift at Microwave Frequencies. Application of the nodal shift method. Measurements on filters in the 4-kMc/s range agree well with calculations. ***M. H. N. Potok.*** *Electronic & Radio Engineer,* v. 35, Oct. 1958, p. 382-386.

453* Recording Techniques for H.F. Direction Finding. Graphical recording systems are described which have been used on a twin-channel direction-finder for producing "bearing indication versus time" and "bearing indication versus signal-amplitude" records. ***C. W. McLeish.*** *Electronic & Radio Engineer,* v. 35, Oct. 1958, p. 386-390.

454 ELF—A New Electroluminescent Display. The ELF screen is a new, flat electroluminescent display which combines very desirable brightness and halftone characteristics with flexible storage capabilities and high scanning speeds. ***E. A. Sack.*** *I.R.E. Proceedings,* v. 46, Oct. 1958, p. 1694-1699.

455 The Helitron Oscillator. A new type of voltage-tuned microwave oscillator, called the helitron is described. This device is a practical example of E-type interaction. ***D. A. Watkins and G. Wada.*** *I.R.E. Proceedings,* v. 46, Oct. 1958, p. 1700-1705.

456 Guided Wave Propagation in Submillimetric Region. An analysis of electromagnetic wave propagation (in TH and TE modes) as well as in TEM transmission lines (e.g., coaxial). ***A. E. Karbowiak.*** *I.R.E. Proceedings,* v. 46, Oct. 1958, p. 1706-1711.

457 Solar Cycle Influence on the Lower Ionosphere and on VHF Forward Scatter. It is concluded that any magnetic influence is smaller on middle than on high latitude scatter circuits, but an effect can be clearly discerned by studying the magnitude of the received signal through a solar cycle. These results show that VHF forward scatter signals are not caused by reflection from meteor trails alone. ***C. Ellyett and H. Leighton.*** *I.R.E. Proceedings,* v. 46, Oct. 1958, p. 1711-1716.

458 A Voltage-Sensitive Switch. Three circuits are presented which show applications of the switch in a time delay, in a series arrangement, and in a biasing network where terminal voltage is greater than the critical breakdown voltage of the switch. ***K. O. Otley, R. F. Shoemaker, and P. J. Franklin.*** *I.R.E. Proceedings,* v. 46, Oct. 1958, p. 1723-1730.

459 Methods of Measurement of the Parameters of Piezoelectric Vibrators. This paper gives in detail the theoretical considerations of the "IRE Standards on Piezoelectric crystals—the Piezoelectric Vibrator", which are based on the frequency of maximum transmission through a simple pi resistance network which includes the vibrator in the series arm. ***E. A. Gerber and L. F. Koerner.*** *I.R.E. Proceedings,* v. 46, Oct. 1958, p. 1731-1737.

460 ADF Interference Blanker Development. Interference blankers have been developed to give improvement ratios of the order of 1000 in the presence of severe precipitation static of the order of 150,000 pulses per second. ***M. M. Newman, J. R. Stahmann, and J. D. Robb.*** *IRE Transactions on Aeronautical and Navigational Electronics,* v. ANE-5, no. 2, June 1958, p. 86-91. (TK1 In6.6a Vis.)

461 Improvements in Radar Data Presentation. This paper describes an application of the storage tube to marine radar, for providing an automatic plot of the equipped vessel as well as all other vessels within the radar's range. It further describes a new type of presentation which combines relative motion with true motion. ***K. V. Curtis and T. J. Kelly.*** *IRE Transactions on Aeronautical and Navigational Electronics,* v. ANE-5, no. 2, June 1958, p. 91-95. (TK1 In6.6a Vis.)

462 Design of Transistor RC Amplifiers. Particular emphasis is placed on operating point stabilization and its relation to such factors as gain, battery drain, and distortion. Only the fundamental common-emitter connection is discussed. ***Ray P. Murray.*** *IRE Transactions on Audio,* v. AU-6, no. 3, May-June 1958, p. 67-76. (TK1 In6.6au Vis.)

463 A Hybrid Type Traveling-Wave Tube for High-Power Pulsed Amplification. ***E. J. Nalos.*** *IRE Transactions on Electron Devices,* v. ED-5, no. 3, July 1958, p. 161-166. (TK1 In6.6ed Vis.)

464 A Barkhausen-Kurz Oscillator at Centimeter Wavelengths. A new device for the generation of high-frequency oscillations with high efficiency and low starting currents is described. ***E. M. Boone, M. Uenohara, and D. T. Davis.*** *IRE Transactions on Electron Devices,* v. ED-5, no. 3 July 1958, p. 196-205. (TK1 In6.6ed Vis.)

465 Reliability Techniques for Electronic Circuit Design. ***L. Hellerman and M. P. Racite.*** *IRE Transactions on Reliability and Quality Control, PGRQC-14,* Sept. 1958, p. 9-16. (TK1 In6.6q Vis.)

466* A Theoretical Analysis of Some Errors in Aerial Measurements. A theoretical analysis of certain aerial problems is carried out with the help of the idea of a spectrum of plane waves introduced by Booker and Clemmow. ***J. Brown.*** *Institution of Electrical Engineers, Proceedings,* v. 105, pt. C, no. 8, Sept. 1958, p. 343-351.

467* Microwave Aspects of Waveguides for Long-Distance Transmission. In particular, it is shown that plain metal waveguides are not suitable for long-range application, unless the waveguide run is substantially straight. Practical waveguides, however, must be able to follow ground contour and other unintentional bends. ***A. E. Karbowiak.*** *Institution of Electrical Engineers, Proceedings,* v. 105, pt. C, no. 8, Sept. 1958, p. 360-369.

468* A Rectifier Modulator With Stable Low Carrier-Leak. After consideration of various types of modulator, the conclusion is reached that the constant-current modulator, originally proposed by Cooper, is probably capable of giving the highest stable level of carrier rejection. ***E. Hands.*** *Institution of Electrical Engineers, Proceedings,* v. 105, pt. C, no. 8, Sept. 1958, p. 381-390.

469* Noise-Reducing Codes for Pulse-Code Modulation. It is suggested that an improvement in output signal/noise ratio can be obtained by modifying the binary code so that errors in its different digits contribute equal amounts of noise power to the output. ***J. E. Flood.*** *Institution of Electrical Engineers, Proceedings,* v. 105, pt. C, no. 8, Sept. 1958, p. 391-397.

470* Intrinsic Directional Coupler Using Elliptical Coupling Apertures. It is found that both codirectional and contradirectional characteristics can be obtained when using elliptical coupling apertures between two rectangular parallel waveguides for the realization of intrinsic directional couplers. ***J. Figanier and E. A. Ash.*** *Institution of Electrical Engineers, Proceedings,* v. 105, pt. C, no. 8, Sept. 1958, p. 432-437.

471* The Use of Equivalent Secondary Sources in the Theory of Ground-Wave Propagation Over an Inhomogeneous Earth. On the basis of approximate boundary conditions and a specially chosen auxiliary function in Green's theorem, the integral equation for the attenuation function is derived. ***Z. Godziński.*** *Institution of Electrical Engineers, Proceedings,* v. 105, pt. C, no. 8, Sept. 1958, p. 448-464.

472* The Fields Associated With an Interface Between Free Space and an Artificial Dielectric. . . . may be predicted by considering the excitation of evanescent modes. ***J. Brown and J. S. Seeley.*** *Institution of Electrical Engineers, Proceedings,* v. 105, pt. C, no. 8, Sept. 1958, p. 465-471.

473* Multi-Gain Representation for a Single-Valued Non-Linearity With Several Inputs, and the Evaluation of Their Equivalent Gains by a Cursor Method. A general method is described for calculating the equivalent gain through a non-linear element for a signal of known amplitude probability distribution, in the presence of other, uncorrelated signals or disturbances, also of known amplitude-probability distributions. ***M. J. Somerville and D. P. Atherton.*** *Institution of Electrical Engineers, Proceedings,* v. 105, pt. C, no. 8, Sept. 1958, p. 537-549.

474 Documents Received at the General Secretariat. A listing of documents received by the General Secretariat concerning fixed service systems, ground wave propagation, tropospheric propagation, ionospheric propagation, standard frequencies and time signals. *International Scientific Radio Union, Information Bulletin,* no. 109, May-June 1958, p. 30-32.

475* Analysis of Junction Transistor Trigger Circuits. Calculation of volt-ampere characteristic with one and two stable equilibrium positions. Study of pulse amplitude and pulse duration with one stable equilibrium position. Selection of

emitter resistance. (*In Russian.*) Analiz puskovykh skhem na ploskostnykh kristallicheskikh triodakh. ***V. V. Chervetsov.*** *Izvestiia Vysshikh Uchebnykh Zavedenii, Radiotekhnika,* 1958, no. 1, Jan.-Feb., p. 95-104.

476* Characteristic of Thermal Condition of Junction-Type Diodes and Triodes at High Grid Bias of a Collector. Method of a graphoanalytical determination of heat emission coefficient. Effect of temperature on transistor characteristics at high grid bias of collector junction. (*In Russian.*) Osobennosti teplovogo rezhima ploskostnykh poluprovodnikovykh diodov i triodov pri bol'shikh napriazheniiakh smeshcheniia kollektora. ***V. I. Samoĭlenko.*** *Izvestiia Vysshikh Uchebnykh Zavedenii, Radiotekhnika,* 1958, no. 2, Mar.-Apr., p. 173-177.

477* Delay Waveguide System for Operation in the Band of Positive Dispersion. Formulas and graphs for approximate calculation of energy parameters and dispersion. (*In Russian.*) Zamedliaiushchaia volnovodnaia sistema dlia raboty v polose polozhitel'noĭ dispersii. ***Z. I. Taranenko.*** *Izvestiia Vysshikh Uchebnykh Zavedenii, Radiotekhnika,* 1958, no. 3, May-June, p. 309-313.

478* Attenuators Made of Ceramic Semiconductors. Various designs of waveguide attenuators with high-quality porcelain and silicon carbide base; and technology of their manufacture. The highest level of working power can be reached with attenuators possessing absorbing walls, and by air-tight coupling of the attenuators with metal housing. (*In Russian.*) Pogloshchaiushchie nagruzki iz poluprovodnikovoĭ keramiki. ***Ia. I. Panova.*** *Izvestiia Vysshikh Uchebnykh Zavedenii, Radiotekhnika,* 1958, no. 3, May-June, p. 329-336.

479 Germanium Diffused Minicrystals and Their Use in Transistors. The process yields a drift *p-n-p* bar-type structure that has fewer practical limitations on emitter, base, and collector resistivities and on base width, for use in high-frequency transistors. ***I. A. Lesk and R. E. Coffman.*** *Journal of Applied Physics,* v. 29, Oct. 1958, p. 1493-1494.

480* On Avalanche Multiplication in Semiconductor Devices. The current multiplication and resulting characteristics have been calculated for the depletion regions of several kinds of junctions, and the results are seen to be similar to those found empirically. It is shown that the breakdown voltage varies less quickly than inversely with doping density. Multiplication, due to avalanching in an undepleted semiconductor carrying very large currents is investigated, and it is found that the current-voltage characteristic should be similar to that observed for multiplication in depletion regions. ***H. L. Armstrong.*** *Journal of Electronics and Control,* v. 5, no. 2, Aug. 1958, p. 97-104.

481* Electron Trajectories in the Gun of an M-Type Carcinotron. Modification to an automatic electron trajectory tracer are described to permit tracing of paths in crossed electric and magnetic fields when the system is of planar symmetry. Optimum operating voltages are suggested with the given geometry. A modification to the electrode geometry is described which would lead to further improvement. ***D. H. Davies and K. F. Sander.*** *Journal of Electronics and Control,* v. 5, no. 2, Aug. 1958, p. 114-128.

482* Circuit Conditions for Parametric Amplification. The differences between parametric amplifiers and mixers or modulators are discussed. ***L. B. Valdes.*** *Journal of Electronics and Control,* v. 5, no. 2, Aug. 1958, p. 129-141.

483* Ferroelectric Crystals and Ceramics. A discussion of crystal structure, electrical properties, and complex ceramics. ***J. M. Herbert.*** *Journal of Electronics and Control,* v. 5, no. 2, Aug. 1958, p. 168-192.

484* Measurement of Voltage-Current Characteristics of Junction Diodes at High Forward Bias. It is concluded that the current flow in a strongly forward biased p-n junction is essentially space-charge limited and represents a complete analogon of the vacuum diode case. ***A. K. Jonscher.*** *Journal of Electronics and Control,* v. 5, no. 3, Sept. 1958, p. 226-244.

485* A Long-Distance Pulse-Propagation Experiment on 20.1 Megacycles. ***Richard Silberstein.*** *Journal of Geophysical Research,* v. 63, no. 3, Sept. 1958, p. 445-466.

486* Further Studies of the Influence of a Ridge on the Low-Frequency Ground Wave. Computations are presented in graphical form for the perturbation of a plane wave by a semicylindrical boss on an otherwise flat ground plane of perfect conductivity. ***James R. Wait and Anabeth Murphy.*** *Journal of Research, National Bureau of Standards,* v. 61, no. 1, July 1958, p. 57-60.

487 A Guide to Ferromagnetic Ceramics. II. Square loop ferrites, microwave ferrites, and permanent magnet ceramics. ***George Economos.*** *Materials in Design Engineering,* v. 48, Oct. 1958, p. 109-114.

488 Millimicrosecond Pulse Techniques. ***I. A. D. Lewis and F. H. Wells.*** 2nd Rev. Ed., 310 pp. 1955. Pergamon Press, New York. (TK7835 L58m)

489* Notes on a Fast Time-to-Amplitude Converter. A time-to-amplitude converter with a full resolution width of 8.5 x 10^{-10} sec is described. The circuit is based on the 6BN6 gated beam tube operated at unusually low electrode voltages. The converter is easily added to an existing fast-slow coincidence assembly. ***R. E. Green and R. E. Bell.*** *Nuclear Instruments,* v. 3, no. 3, Sept. 1958, p. 127-132.

490 Accurate Method for Correction of Slant Range Distortion in High-Altitude Radars and a Contribution to the Optics of Reflecting Conical Surfaces. An optical method for the correction of slant range distortion in high-altitude radar recordings is presented. ***Leo Levi.*** *Optical Society of America, Journal,* v. 48, Oct. 1958, p. 680-686.

491 Seebeck Effect Fluctuations in Germanium. Fluctuations in the Seebeck effect or thermoelectric power of germanium single crystals have been observed. ***James J. Brophy.*** *Physical Review,* v. 111, ser. 2, no. 4, Aug. 15, 1958, p. 1050-1052.

492 The Prediction of Semiconduting Properties in Inorganic Compounds. New semiconducting compounds can be derived from known ones by a process of "cross-substitution". Diamond-type lattices are discussed, and other structures are also considered. ***C. H. L. Goodman.*** *Physics and Chemistry of Solids,* v. 6, no. 4, Sept. 1958, p. 305-314.

493 Proceedings of the 1958 Electronic Components Conference. Reliable Application of Component Parts. Twenty-five papers discussing latest developments in electronic components, reliability, and progress with materials. 222 pp. 1958. Engineering Publishers, New York. (TK7870 Sy94p Vis.)

494 Component Reliability as Function of Tropical Exposure. Analysis of data collected on some 19 types of components representative of those used in six basic applications indicates that with proper protection almost all of today's quality components can withstand tropical environments. ***G. P. Chipman and K. E. Hassler.*** Paper from "Proceedings of the 1958 Electronic Components Conference", Engineering Publishers, New York, 1958, p. 5-6. (TK7870 Sy94p Vis.)

495* E-Type Surface Waves in a Round Waveguide. Analysis of axial symmetrical E-type surface waves which can propagate in round waveguide covered inside with a dielectric layer. (*In Russian.*) Poverkhnostnye volny tipa *E* v kruglom volnovode. ***L. N. Loshakov.*** *Radiotekhnika,* v. 13, no. 9, Sept. 1958, p. 3-7.

496* Effect of Small Deformations of Cross Section on the Operation of a Waveguide. Theoretical study. (*In Russian.*) Vliianie malykh deformatsiĭ poperechnogo secheniia na rezhim raboty volnovoda. ***V. Ia Smorgonskiĭ.*** *Radiotechnika,* v. 13, no. 9, Sept. 1958, p. 63-65.

497 A New Determination of the Free-Space Velocity of Electromagnetic Waves. Determination was made by means of a millimeter-wave interferometer capable of high precision. The result is: $c_0 = 299\ 792{\cdot}50 \pm 0{\cdot}10$ km/s, where the variation represents the standard deviation of a single determination in statistical combination with estimated systematic errors. ***K. D. Froome.*** *Royal Society, Proceedings,* v. 247, ser. A, Sept. 9, 1958, p. 109-122 + 1 plate.

498* Silicon Photocells. Describes operating principle, constructional design, and electrical characteristics. ***Richard Wies-***

ner and Franz Nissl. *Siemens Review*, v. 25, no. 4, 1958, p. 135-140.

499* New Silicon Junction Diodes for Communications. ***Ernst Hofmeister.*** *Siemens Review*, v. 25, no. 4, 1958, p. 141-148.

500* A Measuring Oscillator for the 2.4 to 4.5 kmc/s Range. ***Herbert Neugebauer.*** *Siemens Review*, v. 25, no. 4, 1958, p. 153-156.

501 Transistor Technology. A discussion of the developments in transistor technology covering the preparation and structure of junction structure, preparation, fabrication technology, measurements and characterizations, and reliability studies. ***F. J. Biondi, editor.*** v. III. 416 pp. 1958. D. Van Nostrand Co., Inc., New York. (TK7872.T73 B41t)

502 The Dependence of VHF/UHF Extra-Diffraction Tropospheric Field Strengths on Distance, Antenna Heights, and Horizon Angles. A quantitative prediction of path losses over a smooth earth was derived empirically from available field strength data. The prediction was extended to include the estimated effect of positive horizontal angles. Communications engineers should find this a useful tool in designing circuits of 100 to 600 "effective" miles at frequencies of 100 to 1000 Mcps. ***Edward J. Martin.*** *U. S. Air Force, Cambridge Research Center, TR*-58-149, May 1958, 22 pp. (TK800 Un3.12b Contin.)

503* A. G. C. for Television Receivers. Aspects of Distributed Automatic Gain Control. ***R. H. Skinner.*** *Wireless World*, v. 64, Oct. 1958, p. 486-490.

504* Influence of the Resistance of the Semi-Conductor Body on the Shape of the Diode Current Voltage Characteristic. Calculation of the current voltage characteristic in reverse direction, with low injection levels in the forward direction, temperature relationship with direct current with high injection levels. (*In Russian.*) Vliianie soprotivleniia tolshchi poluprovodnika na vid vol'tampernoĭ kharakteristiki dioda. ***V. I. Stafeev.*** *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 8, Aug. 1958, p. 1631-1641.

505* Statistics of Impurity Centers With Several Levels in Semiconductors of Germanium Type. Causes of the existence of some levels in donor-acceptor and acceptor Au, Cu, and Fe impurities and of others called complex impurities, which tend to vary in behavior when Ge passes to Si. (*In Russain.*) O statistike primesnykh tsentrov s neskol'kimi urovniami v poluprovodnikakh tipa germaniia. ***V. E. Khartsiev.*** *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 8, Aug. 1958, p. 1651-1656.

506* Electrical Conductivity and Photoconductivity of Films of the Al-Sb System Obtained by Vekshinsky's Method. In thin layers of the system Al-Sb on cold glass supports there is only one AlSb compound possessing semiconductor properties. In the case of supports heated above 230 C, two compounds AlSb and Al_2Sb. The latter, at temperatures below 230 C, is unstable. (*In Russian.*) Elektroprovodnost' i fotoprovodimost' plenok sistemy Al-Sb, poluchennykh metodom vekshinskogo. ***M. V. Kot and G. P. Sorokin.*** *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 8, Aug. 1958, p. 1657-1661.

507* Properties and Structure of Triple Semiconductor Systems. IV. Electric and Photoelectric Properties of Solid Solutions of Replacement in the System ZnTe-CdTe. (*In Russian.*) Svoĭstva i struktura troĭnykh poluprovodnikovykh sistem. IV. Electricheskie i fotoelektricheskie svoĭstva tverdykh rastvorov zameshcheniia v sisteme Zn-Te-CdTe. ***B. T. Kolomiets and A. A. Mal'kova.*** *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 8, Aug. 1958, p. 1662-1669.

508* Electrical Durability of a Condenser Paper. The disruptive voltage of condenser paper depends upon the thickness, density and content in current-conducting inclusions of this paper, which exist in the thin, 6-12μ, and "thick" from 12-30μ. (*In Russian.*) Elektricheskaia prochnost' kondensatornoĭ bumagi. ***L. M. Vaisman.*** *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 8, Aug. 1958, p. 1696-1702.

See also: **18** (cooling spaceship electronic components); **103** (properties of steatite ceramics); **346** (evaporation deposition on semiconductor devices); **407** (solid-state devices applied to voltage regulators); **411** (connection inspection by semiconductor thermoresistance); **571** (directional hardness of Si).

ENGINEERING ECONOMICS

509 Chemical Week Buyers' Guide Issue. Listings are divided into chemicals, services, and equipment. *Chemical Week*, v. 83, no. 13, pt. 2, Sept. 27, 1958, 720 pp.

510* Modernize Generation to Cut Costs. Contains sections on how modern is American industry; plant retirement rates; design surveys for plant improvement; and modernization opportunities in power plants. ***John J. Kearney.*** *Electrical World*, v. 150, Oct. 6, 1958, p. 71-90.

511* How Economic Depreciation Works. Details of how utility capital can be conserved. *Electrical World*, v. 150, Oct. 20, 1958, p. 127-130.

512 Fuels and Power in Manufacturing Industries. Compares the quantities and costs of each of the fuels, coal, coke, oil, natural gas, and manufactured gas, used in manufacturing in 1947 and 1954. Consumption of electrical energy, quantities purchased from utilities, quantities generated by industry, and consumption of electric power in 1947 and 1954 is included. ***W. H. Voskuil.*** *Illinois State Geological Survey, Circular* 259, 1958, 25 pp. (TN21 IL6.7 Vis.)

513 Energy Studies. Work carried out by the European Coal and Steel Community (ECSC) and the form that these studies take. ***R. Regul.*** *Institute of Petroleum Review*, v. 12, Sept. 1958, p. 299-306.

514 1958 Pesticides Season. A regional survey of trends in sales, new products, and costs. *Journal of Agricultural and Food Chemistry*, v. 6, Oct. 1958, p. 728-734.

515* The Role of Research in Marketing Metals. Combined with intelligent and aggressive development and promotion, research can help increase the consumption of metal products. ***W. M. Peirce.*** *Mining Congress Journal*, v. 44, Oct. 1958, p. 50-53.

516* Timber Resources for America's Future. Summarizes some recent U. S. Government publications. ***A. B. Recknagel.*** *Northeastern Logger*, v. 7, no. 4, Oct. 1958, p. 18 + 2 pages.

517* Industrial Plant Design. Sixteen articles demonstrating sound planning for coming growth in industrial plant design. ***L. E. Stewart.*** *Power*, v. 102, Oct. 1958, p. 77 + 43 pages.

518* Pipeline Moves Coal in Ohio. Considers the economic aspects of this invasion into railroad freight revenue. *Railway Age*, v. 145, Oct. 6, 1958, p. 20 + 2 pages.

519* The Influence of Transportation on the Location of Iron and Steel Industries. Importance of this problem within the framework of the European coal and steel community. The Lorraine iron and steel industry is at present handicapped by the German and Belgian railroad tariff structures. Correction of this situation within some years by the canalization of the Moselle and the carbonization of the Lorraine coal. (*In French.*). L'influence des transports sur la localisation des industries sidérurgiques. ***J. Pinot.*** *Revue de l'Industrie Minérale*, v. 40, no. 8, Aug. 1958, p. 603-614.

520 Britain Expects Improvement. Iron and steel production is still below last year's, but economists are optimistic. Upturn is expected early next year. *Steel*, v. 143, Oct. 27, 1958, p. 45.

521 Economic Aspects and the Supply Situation for Columbium. After reviewing consumption, present and future applications, and the market situation, it is concluded that cessation of government restrictions on Cb use, completion of minimum stockpile objectives, the promise of greatly improved supplies, and an intensified program of research on both recovery of the metal and new uses for it should combine in contributing

to: increased usage of Cb; lower prices for all forms of the metal; and a more stable price situation. ***Ronald L. Carmichael.*** Paper from "Technology of Columbium (Niobium)", p. 16-19, 1958. John Wiley & Sons, New York. (TN799.N7 EL25t Over.)

522* Current Economic Developments in Europe. *United Nations, Economic Bulletin for Europe,* v. 10, no. 2, Aug. 1958, p. 1-35.

523 Process Heat Generation and Consumption, 1939 to 1967. Emphasis has been placed on the variety of heat applications in United States manufacturing industries with some discussion of other important uses. The generation of electricity is excluded from this analysis. ***W. Lawrence Prehn, Jr. and Richard R. Tarrice.*** *U. S. Atomic Energy Commission, AECU-3664,* Jan. 1958, 91 pp. (UF767 U3au Contin.)

See also: **585** (market analysis of taconite); **586** (mineral production of Illinois in 1957); **613** (Southeastern Alaska's mineral industry); **659** (trend to larger turbogenerators); **1011** (basic elements of management accounting).

FLUID MECHANICS

524 Regular Solution Theory for Gas-Liquid Solutions. Regular-solution equations developed by Hildebrand and others require modification for solutions of gases in liquids, which are presented herein. ***J. M. Prausnitz.*** *A.I.Ch.E. Journal,* v. 4, no. 3, Sept. 1958, p. 269-272.

525 Generalized Correlation for Loading in Packed Towers With Countercurrent Gas-Liquid Flow. The similarity between the characteristics of the ball-and-tube system and those of the randomly packed tower suggests that loading in the latter system is also due to wave formation. With this concept of loading, a correlation has been derived. ***J. E. Howkins and J. F. Davidson.*** *A.I.Ch.E. Journal,* v. 4, no. 3, Sept. 1958, p. 324-329.

526 An Improved Experimental Reactor for Applied Kinetic Studies. Descriptions of the reactor and its operation are given, together with an assessment of errors and the advantages and disadvantages of the recirculation technique. ***Thomas K. Perkins and Howard F. Rase.*** *A.I.Ch.E. Journal,* v. 4, no. 3, Sept. 1958, p. 351-355.

527 Axial Dispersion of Mass in Flow Through Fixed Beds. A theory based upon bed-void cell-mixing efficiency is developed. ***J. J. Carberry and R. H. Bretton.*** *A.I.Ch.E. Journal,* v. 4, no. 3, Sept. 1958, p. 367-375.

528 A Method for Predicting Supercompressibility Factors of Natural Gases. A working method for the accurate prediction of these factors within the pressure range of 0 to 3000 psi and in terms of gas properties generally known or conveniently determined. ***R. H. Zimmerman, S. R. Beitler, and R. G. Darrow.*** *ASME, Transactions,* v. 80, no. 7, Oct. 1958, p. 1358-1362.

529 Possible Similarity Solutions of the Laminar, Incompressible, Boundary-Layer Equations. A review of research on the problem of obtaining similarity solutions of the above three-dimensional equations is presented along with a general method of analysis for treating the problem. ***A. G. Hansen.*** *ASME, Transactions,* v. 80, no. 7, Oct. 1958, p. 1553-1562.

530 Flow Laws of Two-Phase Systems Met by Dimensional Analysis. Appraises recent French work on the dynamics of two-phase flow in which the relationship between the Reynolds, Weber, and Froude numbers is represented graphically in a tetrahedron. ***P. G. Morgan.*** *Chemical Age,* v. 80, Sept. 20, 1958, p. 488.

531 How *T* and *P* Change Gas Viscosity. Today's best engineering methods for calculating the effect of temperature and pressure variation on the viscosity of a gas. ***Wallace R. Gambill.*** *Chemical Engineering,* v. 65, Oct. 20, 1958, p. 157-162.

532* Pressure Loss and Heat Transfer in Annular Gaps. The pressure loss with isothermal flow and the heat transfer on heating the gap from the surrounding tube was measured on seven annular gaps of different widths, through which air was flowing. The influence of the ratio of inner to outer tube diameter on the pressure loss and heat transfer was explained. (*In German.*) Druckverlust und Wärmeübergang in Ringspalten. ***R. Koch and K. Feind.*** *Chemie-Ingenieur-Technik,* v. 30, Sept. 1958, p. 577-584.

533* Model Experiments on Flow in Industrial Gas Burners. In a series of experiments on models of 1/10 scale the influence of the outlet cross-section on the flow of the emerging streams was evaluated systematically at constant flow rate. (*In German.*) Modellversuche über die Strömung in Industriegasbrennern. ***H. Boenecke.*** *Chemie-Ingenieur-Technik,* v. 30, no. 9, Sept. 1958, p. 585-588.

534* Analytical Determination of the Disk Friction Coefficient in Turbulent Region. A method of analytical determination of the coefficient of disk friction in developed turbulent regions and its adaptability in engineering calculations. (*In Russian.*) Analiticheskoe opredelenie koeffitsienta diskovogo treniia v turbulentnoi oblasti. ***N. N. Kupriashin.*** *Energomashinostroenie,* v. 4, no. 8, Aug. 1958, p. 17-19.

535 Friction Factors for Axial Non-Newtonian Annular Flow. Suggested correlation method for friction factors. ***William R. Wilcox.*** *Industrial and Engineering Chemistry,* v. 50, Oct. 1958, p. 1599-1600.

536* Frictional Losses of Head in Steady Uniform Flow. Based on the analogy of partly filled lines of circular cross-sections, formulae for flow in open channels are derived. ***P. G. Franke.*** *Journal of Scientific & Industrial Research,* v. 17B, Aug. 1958, p. 289-296.

537 Heat Transfer Nomographs. I. Velocity of Liquids and Gases in Tubes. ***Jose Alvarez and Carlos Duhne.*** *Petroleum Refiner,* v. 37, Oct. 1958, p. 131-132.

538 Heat Transfer in Turbulent Flow Through Nonconcentric Annuli Having Unequal Heat Release From the Walls. An analytical procedure is presented for determining the temperature field in a nonconcentric annulus when the heat released from the bounding, circular, cylindrical walls is of unequal strength. ***J. F. Heyda.*** *U. S. Atomic Energy Commission, APEX-391,* June 1957 (Issued Aug. 14, 1958), 29 pp. (UF767 Un3.1ap Contin.)

539* Distribution of Momentum in a Continuous Fluid Jet at a Supersonic Velocity. Investigation of a continuous horizontal fluid jet at subsonic and supersonic (from 300 to 540 meters per second) velocity. Diagram of equipment used for the experiments. Experimental results. Relationship between viscosity of flowing out fluid and the angle of conicity of the jet. An increase of viscosity decreases angle of conicity. (*In Russian.*) Raspredelenie kolichestva dvizheniia v nepreryvnoĭ zhidkostnoĭ strue sverkhzvukovoĭ skorosti. ***A. A. Semerchan, et al.*** *Zhurnal Tekhnicheskoĭ Fiziki,* v. 28, no. 9, Sept. 1958, p. 2062-2071 + 1 plate.

FOOD TECHNOLOGY

540* Diet and Atherosclerotic Disease. IV. Epidemiology of Coronary Heart Disease in the United States. V. Diet—a Key, but Not Exclusive Etiologic Agent. ***Jeremiah Stamler.*** *American Dietetic Association, Journal,* v. 34, Oct. 1958, p. 1053-1064.

541* Studies on Synthesis of Milk. Artificial lactation and perfusion of bovine mammary gland; study of the process of fat synthesis, protein synthesis and carbohydrate metabolism. *Comptes Rendus de Recherches,* no. 20, Sept. 1958, 126 pp.

542 Studies on Enzymatic Tenderization of Meat. II. Panel and Histological Analyses of Meat Treated With Liquid Tenderizers Containing Papain. III. Histological and Panel Analyses of Enzyme Preparations From Three Distinct Sources. Ribeye steaks were made more tender by

treatment with liquid preparations containing papain, sodium chloride, and hydrolyzed vegetable proteins. A close relationship was demonstrated between enzyme-induced changes in tissue structure and panel response to tenderness differences. The ability of an enzyme to hydrolyze hemoglobin and gelatin did not reflect its activity as a meat tenderizer. ***C. Edith Weir, H. Wang, Marion L. Birkner, Jean Parsons, and Betty Ginger.*** *Food Research*, v. 23, no. 5, Sept.-Oct. 1958, p. 411-422; p. 423-438.

543 A Study of the Biochemistry of Irradiated Potatoes Stored Under Commercial Conditions. Under the conditions of this study the most significant result was the much greater rotting of the irradiated samples when compared with the controls. The lots irradiated at the high dosages had 33.0% more rot than the controls and the low dosage lots had 29.0% more rot than the controls. ***J. S. Schreiber and M. E. Highlands.*** *Food Research*, v. 23, no. 5, Sept.-Oct. 1958, p. 464-472.

544* Present Capabilities and Future Needs for Space Feeding. ***Albert A. Taylor.*** *Food Technology*, v. 12, Sept. 1958, p. 442-444.

545* Feeding Crews in Air Vehicle of the Future. Needs pertain to a greater variety of concentrated and precooked dehydrated foods, further advances in the cold sterilization of food, improved methods of food packaging, and development of lighter weight food service equipment. In addition, information is still needed relative to the acceptability of food when man is confronted with varying kinds and degrees of stress. ***Beatrice Finkelstein.*** *Food Technology*, v. 12, Sept. 1958, p. 445-448.

546* Closed Cycle Biological Systems for Space Feeding. Quantitative dimensions have been assigned to the material requirements of a man in space. For excursions of relatively short duration the weight required to fulfill these daily material requirements is estimated at 9 pounds per man. Longer excursions may warrant the installation of equipment for recycling water. This should reduce the daily expenditure to about 4 pounds per man. It is possible that this can be decreased another pound per day by regenerating lithium hydroxide used for absorption of carbon dioxide. Oxygen from carbon dioxide is regarded as hazardous. ***M. C. Brockmann, A. S. Henick, G. W. Kurtz, and R. G. Tischer.*** *Food Technology*, v. 12, Sept. 1958, p. 449-454.

547* Space Feeding Problems: A Bibliography. Space feeding problems are due to the physical conditions of the space which flights traverse, the restrictions imposed by the size and shape of the vehicle in which the flight is made, and the basic food, oxygen and water needs of man during the flights. This bibliography cites many background references containing the information needed to think logically on the problems involved and to conduct research on actual space feeding problems. ***James G. Hodgson and Robert G. Tischer.*** *Food Technology*, v. 12, Sept. 1958, p. 459 + 5 pages.

548* The Role of Lysine in Cereal Food Products. Supplementation of wheat-based foods with lysine will improve their protein quality and will result in improved growth and tissue synthesis. Lysine supplementation also has improved the protein of rice, rye, and breakfast cereals. ***Charles Feldberg and Carl P. Hetzel.*** *Food Technology*, v. 12, Oct. 1958, p. 496-500.

549 Effect of Processing on the Epsilon-Amino Groups of Lysine in Peanut Proteins. Peanut flour can be analyzed for protein deterioration by following the change in the ϵ-amino groups of lysine, which can be determined colorimetrically as the ϵ-2,4-dinitrofluorobenzene derivative. ***Louise Bensabat, Vernon L. Frampton, Layton E. Allen, and Ronald A. Hill.*** *Journal of Agricultural and Food Chemistry*, v. 6, Oct. 1958, p. 778.

550 Surface Irradiation and Aseptic Muscle Autolysis. I. Biochemical and Structural Autolytic Modifications Occurring in Rabbit, Lamb and Hog Irradiated and Non-Irradiated Fresh Muscles, During Aseptic and Anaerobic Storage in the Dark at 25°C and 37°C. II. Food Preservation Combining the Epinephrine Anti-Autolytic Effect With Surface Irradiation. Enzymatic autolysis and bacterial spoiling are chiefly responsible for meat deterioration. The combination treatment described in these papers seems to have immediate practical applications in preserving meat without refrigeration. I. ***R. Zender, C. Lataste-Dorolle, R. A. Collet, P. Rowinski, C. Radouco-Thomas, and R. F. Mouton.*** II. ***C. Radouco-Thomas, C. Lataste-Dorolle, R. Zender, R. Busset, and R. F. Mouton.*** *Second International Conference on the Peaceful Uses of Atomic Energy, Geneva, Sept. 1958, Paper* P/258, 31 pp; P/258/Add.1, 32 pp. (QC770 In8a2 Contin.)

551* Antibiotics as Food Additives and Food Preservatives. (*In Swedish.*) Antibiotika som fodermedelstillsatser och konserveringsmedel. ***Torsten André.*** *Svensk Kemisk Tidskrift*, v. 70, no. 8, 1958, p. 315-321.

See also: **32** (radiation in food preservation).

FUELS AND COMBUSTION

552* Fundamental Research on the Antiknock Properties of Pure Hydrocarbons and Their Blends. Nineteen years of the work of API Research Project 45 are reviewed, with emphasis on the antiknock ratings of blends. The technical inadequacy of calculated blending octane numbers is pointed out. ***L. C. Beard, Jr.*** *American Petroleum Institute, Proceedings*, v. 37, sec. 6, 1957, p. 35-45.

553* Changes in the Pore Structure of Coke During Carbonization and Gasification. ***A. Cameron and W. O. Stacy.*** *Australian Journal of Applied Science*, v. 9, no. 3, Sept. 1958, p. 283-302.

554* Recent Developments in the Use of Gas for the Ceramic Industry. V. ***K. Davis and L. Walker.*** *British Clayworker*, v. 67, Sept. 1958, p. 144-146.

555* Studies in Coke-Oven Technology by the U. S. Bureau of Mines. *Coke and Gas*, v. 20, Oct. 1958, p. 408 + 7 pages.

556* The Carbonisation of Coal in Coke Ovens. II. This survey of the present position of coke-oven plant raises the question of whether the coke-oven process as we now understand it is the optimum method for producing metallurgical coke. ***G. W. Lee.*** *Coke and Gas*, v. 20, Oct. 1958, p. 419-425.

557* Trends in Present Day Coal Research in the United States of America. II. ***Alan Fowler Williams.*** *Coke and Gas*, v. 20, Oct. 1958, p. 426-430.

558 Mechanical Coal Sampling. Over the last several years the subject of mechanical coal sampling has been given considerable attention. Reports a sampling device now being manufactured. ***Edward Ingle.*** *Combustion*, v. 30, no. 4, Oct. 1958, p. 47-48.

559 Oxidation of Coal. The major topics discussed are the initial attack of oxygen, oxidation kinetics, oxidation results and the chemical nature of coal, storage and spontaneous combustion, determination of the extent of oxidation, and the effect of oxidation on coking properties. ***G. R. Yohe.*** *Illinois State Geological Survey, Report of Investigations* 207, 1958, 51 pp. (TN21 IL6.7r Vis.)

560* Some Investigations With a Small Cyclone Combustor. Performance of a small experimental slagging cyclone combustor is described. ***H. R. Hoy, A. G. Roberts, and D. M. Wilkins.*** *Institute of Fuel, Journal*, v. 31, Oct. 1958, p. 429-457. + 3 plates.

561* The Thermal Recovery Process—An Analysis of Laboratory Combustion Data. ***A. L. Benham and Fred H. Poettmann.*** *Journal of Petroleum Technology*, v. 10, Sept. 1958, p. 83-85.

562* Investigation of the Coking Process by the Method of Direct Electro-Heating of the Coal Charge. Possibility of studying the effect of various factors on the quality and quantity of solid, liquid, and gaseous coking products in one single test. (*In Russian.*) Issledovanie protsessa koksovaniia metodom priamogo elektronagreva ugol'noĭ zagruzki. ***Iu. N. Bogoslovskiĭ, G. N. Makarov, and T. Uzunov.*** *Nauchnye Doklady Vysshei Shkoly, Khimiia i Tekhnologiia*, 1958, no. 3, p. 559-562.

See also: **270** (coal tar); **329** (flame spectroscopy); **512** (fuel costs in power industries); **518** (coal pipeline); **682** (transient heat-flow analysis by electrical-analog method).

GEOLOGY, GEOPHYSICS, MINERALOGY, AND MINING ENGINEERING

563 Advances in Geophysics. Chapter headings as follows: from polar years to IGY; microseisms; the size and shape of the earth; oceanic tides; ultraviolet absorption process in the upper atmosphere; and the physics of cloud modification. ***H. E. Landsberg and J. Van Mieghem, editors.*** v. V. 325 pp. 1958. Academic Press Inc., New York. (QC806 Ad95 Vis.)

564* Cosmic Radiation—How Much of a Barrier? Reviews present knowledge of this problem. ***William Leavitt.*** *Air Force*, v. 41, Oct. 1958, p. 52-55.

565* Devonian System in Williston Basin and Central Montana. Summarizes the stratigraphy and geologic history of the Devonian system and proposes a uniform subsurface nomenclature for Devonian rocks in North Dakota, South Dakota, eastern and central Montana east of the 111° meridian, and the adjacent part of Wyoming. ***C. A. Sandberg and C. R. Hammond.*** *American Association of Petroleum Geologists, Bulletin*, v. 42, Oct. 1958, p. 2293-2334.

566* Petroleum Prospects of Western Parts of Great Australian Artesian Basin. The deeper central and western development of the Basin is now considered to offer the most promising prospects for commercial oil on the Australian continent. ***Reg. C. Sprigg.*** *American Association of Petroleum Geologists, Bulletin*, v. 42, Oct. 1958, p. 2465-2491.

567* $40 Per Person Annually—Saved. Air pollution corrective measures taken by Lehigh Valley municipalities bring measurable savings. ***R. Emmett Dohetry.*** *American City*, v. 73, Oct. 1958, p. 129-130.

568 A Calcium Analogue of Chondrodite. Discusses the Ca analogue of composition $Ca_5(SiO_4)_2(OH)_2$. The name calciochondrodite is suggested. ***E. R. Buckle and H. F. W. Taylor.*** *American Mineralogist*, v. 43, nos. 9-10, Sept.-Oct. 1958, p. 818-823.

569 The Effects and Geologic Significance of Potassium "Fixation" by Expandable Clay Minerals Derived from Muscovite, Biotite, Chlorite, and Volcanic Material. ***Charles E. Weaver.*** *American Mineralogist*, v. 43, nos. 9-10, Sept.-Oct. 1958, p. 839-861.

570 The Alkali Feldspars: IV. The Cooling History of High-Temperature Sodium-Rich Feldspars. A redetermination of part of the alkali feldspar solvus has been made using single crystal X-ray methods to obtain the composition of the Na-rich phase of a natural cryptoperthite subjected to various heat treatments. ***J. V. Smith and W. S. MacKenzie.*** *American Mineralogist*, v. 43, nos. 9-10, Sept.-Oct. 1958, p. 872-889.

571 A Study of the Directional Hardness in Silicon. The directional hardness of single crystal Si has been investigated both by a method of peripheral grinding on oriented thin circular specimens and by Knoop microindentations. Experimental results are compared with published data on diamond, which has the same crystal structure. ***A. A. Giardini.*** *American Mineralogist*, v. 43, nos. 9-10, Sept.-Oct. 1958, p. 957-969.

572* Geological Research and the American Petroleum Institute. Reviews geological research supported by the Institute. ***C. I. Alexander.*** *American Petroleum Institute, Proceedings*, v. 37, sec. 6, 1957, p. 46-50.

573* The Geochemistry of Uranium and Lead-Age-Dating. Primarily concerns the use of the isotopes of U and Th, all of which decay to isotopes of Pb. ***W. Jacque Yost.*** *American Petroleum Institute, Proceedings*, v. 37, sec. 6, 1957, p. 51-53.

574 Low-Cost Meteorological Rocket Systems. Simple, practical systems of the type described here, in which expendable equipment could be held to about $155 per firing, would prove mutually beneficial to both meteorology and rocketry. ***I. G. Poppoff.*** *Astronautics*, v. 3, Oct. 1958, p. 26 + 3 pages.

575* Factors Influencing Ground Surface Movement. The factors considered were time, size of the broken ground surface, thickness and inclination of the broken bed, depth under the broken ground surface, direction of roof applied to groundbreaking, the physicomechanical characteristics of the associated rocks, the geological, hydrological, and tectonical conditions of the area. (*In Hungarian.*) A külszin elmozdulását befolyásoló tényezők. ***Ferenc Martos.*** *Bányászati Lapok*, v. 13, no. 6, June 1958, p. 367-372.

576 Some Geophysical Applications of the Elasticity Theory of Dislocations. Some aspects of the elasticity theory of dislocations, which may be of geophysical significance are discussed. The central position of *A*- and *B*-nuclei of strain in this theory is emphasized. Applications to cracks and seismological models are indicated. ***J. A. Steketee.*** *Canadian Journal of Physics*, v. 36, Sept. 1958, p. 1168-1198.

577 Raising Productivity by Updating Mining Methods. *Coal Age*, v. 63, Oct. 1958, p. 92-96.

578* Some Properties of Mixed Gadolinium Erbium and Gadolinium-Yttrium Garnets. Values of the parameters of the crystal lattice, the Curie points and the compensation points of the garnets studied. The variation of the compensation points was explained. (*In French.*) Quelques propriétés des grenats mixtes de gadolinium-erbium et de gadolinium-yttrium. ***Gérard Villers, Jean Loriers, and Colette Claudel.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 247, no. 8, Aug. 25, 1958, p. 710-713.

579* We Learn 'To Drill Better—Electrically'. From study of 124 existing DC rigs, electrical manufacturers are developing systems for better performance, simplicity, and economy. ***Glenn W. Webb.*** *Drilling*, v. 19, Oct. 1958, p. 67 + 1 page.

580* Concrete Pile Foundations for Over-Water Drillsites. Creole finds initial costs low, service life long, maintenance simplified on Lake Maracaibo. ***G. A. McCammon.*** *Drilling*, v. 19, Oct. 1958, p. 69-71.

581* Blowouts can be Controlled With Stinger Closure Device. Very often a closure device to kill a wild well is prepared from existing equipment elements on location after a blowout has occurred. Here is a tool which is made up and ready on the rig floor before the blowout occurs. ***W. E. Harrelson and John E. Ortloff.*** *Drilling*, v. 19, Oct. 1958, p. 80-81.

582 Drilling and Production Practice, 1957. These 27 papers have been selected by the Publications Committee of the American Petroleum Institute's Central Committee on Drilling and Production Practice from among those presented at Division of Production meetings during 1957. 300 pp. 1958. American Petroleum Institute, New York. (TN862 Am35d)

583* Role of Clay Minerals in the Transportation of Iron. ***Dorothy Carroll.*** *Geochimica et Cosmochimica Acta*, v. 14, nos. 1/2, Aug. 1958, p. 1-28.

584* Analyses of the Standard Rocks Gl and Wl. Spectrographic determinations, by a method based on successive additions, are reported for Co, Cu, Ga, Mn, Mo, Ni, V, and Zr in the standard rocks Gl and Wl. ***R. M. McKenzie, A. C. Oertel, and K. G. Tiller.*** *Geochimica et Cosmochimica Acta*, v. 14, nos. 1/2, Aug. 1958, p. 68-72.

585* The Mining of Taconite, Lake Superior Iron Mining District. A history and market analysis of this upcoming mineral. ***Clyde F. Kohn and Raymond E. Specht.*** *Geographical Review*, v. 48, no. 4, Oct. 1958, p. 528-539.

586 Mineral Production in Illinois in 1957. The variety, amounts, and values of minerals produced in Illinois for 1956 and 1957 are summarized in this annual report. ***W. L. Busch.*** *Illinois State Geological Survey, Circular* 257, 1958, 39 pp. (TN21 IL6.7c Vis.)

587* A Search for Magnetic Effects From Meteors. ***Gerald S. Hawkins.*** *Journal of Geophysical Research*, v. 63, no. 3, Sept. 1958, p. 467-475.

588* Meteorites. A study of meteorites including siderites, siderolites, aerolites, and abnormal meteorites. ***Charles P. Thornton.*** *Mineral Industries*, v. 27, no. 6, Mar. 1958, p. 1 + 4 pages.

589* Corrosion Control in Elk Basin Field. Control measures are applied to a wide variety of corrosion processes in Elk Basin Field. ***Troy B. Morris, Norman L. Ness, and T. W. McSpadden.*** *Mines Magazine*, v. 48, Oct. 1958, p. 17-22.

590 Rotation of Artificial Earth Satellites. Analysis and effects of rotation; ways of control for celestial observation are proposed. ***R. N. Bracewell and O. K. Garriott.*** *Nature*, v. 182, Sept. 20, 1958, p. 760-762.

591 5 Factors That Affect Drilling Rate. Factors discussed are: hydrostatic pressure, bit weight and rotary speed, mud properties, hydraulics, and economics. ***Preston L. Moore.*** *Oil and Gas Journal*, v. 56, no. 40, Oct. 6, 1958, p. 141 + 19 pages.

592 Two New Recovery Processes. Miscible drive and combustion drive processes appear to have considerable merit. ***Norman J. Clark.*** *Oil and Gas Journal*, v. 56, no. 40, Oct. 6, 1958, p. 220-221.

593 Less Oxygen = Less Corrosion. Above applies when water flooding with oil-field brine. ***L. C. Case and W. C. Whiteside.*** *Oil and Gas Journal*, v. 56, no. 42, Oct. 20, 1958, p. 74-76.

594 Healthy Manhood is Predicted for West Canada's Infant Natural-Gas Industry. Discusses that part of western Canada containing the western Canada sedimentary basin. ***Jack G. Stabback.*** *Oil and Gas Journal*, v. 56, no. 43, Oct. 27, 1958, p. 69-74.

595* Magnetic-Fractionation-Mineralogical Analysis. Magnetic-fractionation-mineralogical analysis yields the qualitative character of the relationship between magnetic parameters of the rock or ore and its mineralogical composition, and permits a determination of the quantitative properties of this relationship. ***F. N. Efimov.*** *Petroleum Geology*, v. 2, no. 1b, 1958, p. 92-101.

596* Fundamental Problems in the Field of the Method of Prospecting and Exploration for Oil and Gas. According to preliminary rough drafts, the annual Russian production over 15 years should increase for oil from 98 million tons in 1957 to 350–400 million tons, and for gas from 21 billion cubic meters in 1957 to 270–320 billion cubic meters. ***I. O. Brod and V. G. Vasilev.*** *Petroleum Geology*, v. 2, no. 2a, 1958, p. 103-111.

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598* Method of Determination of the Quantity of Exploitable Reserves of Gas in Oil and Gas Deposits. ***P. I. Mikhailitskii.*** *Petroleum Geology*, v. 2, no. 2b, 1958, p. 202-206.

599* On the Method of Determination of the Age of Platforms. ***V. G. Vasilev.*** *Petroleum Geology*, v. 2, no. 3-A, 1958, p. 243-250.

600* Calculation of Oil Reserves in Fissured Reservoirs. ***G. K. Maksimovich.*** *Petroleum Geology*, v. 2, no. 3-A, 1958, p. 258-260.

601* The 25,000-ft. Hole Ushers in a New Drilling Era. Special report on deep drilling. *Petroleum Week*, v. 7, no. 14, Oct. 3, 1958, p. 35 + 13 pages.

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603 Cosmic Rays in the Earth's Magnetic Field. An empirical expression for the actual cut-off momenta is deduced from the variation in sea-level nucleon intensity between London and Cape Town. ***P. Rothwell.*** *Philosophical Magazine*, v. 3, no. 33, Sept. 1958, p. 961-970.

604 The Aerial Photograph and Applied Geomorphology. Chief objective is to determine geological features of the earth's surface through their geomorphological expressions. It is possible to produce for the field geologist a very comprehensive record of the characteristics of the earth's surface. ***B. A. Tator.*** *Photogrammetric Engineering*, v. 24, no. 4, Sept. 1958, p. 549-561.

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606 Trends in Climatology. Advances in the investigation of climates. ***H. E. Landsberg.*** *Science*, v. 128, Oct. 3, 1958, p. 749-758.

607 Among Southern Galaxies—X. Three pictures conclude the series of reproductions from the Cape Photographic Atlas of Southern Galaxies. *Sky and Telescope*, v. 18, no. 1, Nov. 1958, p. 26-27.

608 The New IAU Nomenclature for Mars. In an effort to assist Martian studies, the International Astronomical Union adopted a simplified and more convenient system. ***Joseph Ashbrook.*** *Sky and Telescope*, v. 18, no. 1, Nov. 1958, p. 23-25.

609 The Statistics of Meteors in the Earth's Atmosphere. Current meteor theory is briefly outlined, and certain of its predictions compared with statistics of the observed sample of meteors. The observed length of trail is less than that predicted by the single-body theory. ***Gerald S. Hawkins and Richard B. Southworth.*** *Smithsonian Contributions to Astrophysics*, v. 2, no. 11, 1958, p. 349-364. (QB1 Sm69.1c Contin.)

610* Sinking No. 2 Shaft Harmony Gold Mining Company Limited. Refers to the new technique of pre-cementation, i.e., injection of cement from surface into deep boreholes on the shaft site. The principles necessary to establish subsequent development are outlind, especially the design of excavations adjacent to the shaft. ***S. C. Newman.*** *South African Institute of Mining and Metallurgy, Journal*, v. 59, no. 2, Sept. 1958, p. 71-109.

611* Soviet Bloc International Geophysical Year Information. *Soviet Bloc International Geophysical Year Information*, Oct. 17, 1958, 22 pp.

612* On the Relation Between Pressure and Wind, With Particular Reference to a Vortex. Shows that if the boundary conditions to solve the vorticity and balance equations are prescribed independently, then the primitive equations of motion are not satisfied. ***Julián Adem.*** *Tellus*, v. 10, no. 3, Aug. 1958, p. 326-330.

613 Southeastern Alaska's Mineral Industry. This report presents information about the minerals of Southeastern Alaska and the factors that affect development of a mining industry in that area. ***Alvin Kaufman.*** *U. S. Bureau of Mines Information Circular* 7844, 1958, 37 pp. (TN21 Un3i Vis.)

614 Chemical Solidification of Soil in Tunneling at a Minnesota Iron-Ore Mine. Does not consider the costs of methods of ground support. The process described was a comparatively safe method of completing a tunnel after dangerous conditions had developed under conventional mining methods. ***R. O. Pynnonen and Allen D. Look.*** *U. S. Bureau of Mines Information Circular* 7846, 1958, 8 pp. (TN21 Un3i Vis.)

615 Coal—A Dark Mineral With a Bright Future. Though wood fires preceded it and atomic fission will replace it to some extent, coal still remains king of the energy-producing materials. *Westinghouse Engineer*, v. 18, no. 6, Nov. 1958, p. 176-179.

616 Jet Deflection Drilling. Over-all directional job costs are being reduced considerably through application of the jet technique. ***Robert W. Scott.*** *World Oil*, v. 147, Oct. 1958, p. 137-139.

617 Supercharging. IV. Know Your Mud Pump—It Can Save You Money. Higher speeds, greater efficiency, smoother operation, and longer parts life result from charging the suction

pipe. ***Samuel L. Collier and N. B. Heaps.*** *World Oil,* v. 147, Oct. 1958, p. 143-148.

618 Engineered Completions Increase Oil Recovery. Selective perforating, reduced shot density and engineered stage fracturing will result in more effective reservoir drainage, more effective use of reservoir energy, and greater ultimate recovery. ***R. W. Coburn.*** *World Oil,* v. 147, Oct. 1958, p. 173 + 7 pages.

619 New Look at Salt Dome Geology May Increase Gulf Coast Reserves. I. Problems of Detailed Correlation. ***V. N. Sovinsky.*** *World Oil,* v. 147, Oct. 1958, p. 180-181.

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621* Progress in the Development of Sucker Rods for Oil-Well Pumping. II. ***Lester C. Uren.*** *World Petroleum,* v. 29, Oct. 1958, p. 54 + 4 pages.

GRAPHIC ARTS

622* The How and Why of Carton Lithography. I. Introduction. A brief description of letterpress, flexography, gravure and offset with advantages and limitations of each method. *Boxboard Containers,* v. 76, Oct. 1958, p. 37-39.

623* The Printing Industry in the Soviet Union. A series of questions and answers during a tour of inspection by a British team. ***A. J. Buckle.*** *British Printer,* v. 71, Oct. 1958, p. 75-79.

624 The International-Wattier Process. A New Method of Gravure Color Reproduction. Steps followed in the International-Wattier process. Some details cannot be published because of pending patents. *Gravure,* v. 4, Oct. 1958, p. 18-21.

625 Diazotype Film Aids Biologists in Microscope Research. A scientific application of diazotype film leads off a special section on current uses of diazotype and blueprint materials. ***Harold C. Baitz.*** *Industrial Photography,* v. 7, Oct. 1958, p. 21 + 3 pages.

626* Some Experiments on Image Quality in Photographic Lenses. Resolving power, line profile, edge profile and spatial frequency response have been determined for a 10¼" F/4.5 photographic objective. The results for a series of positions on axis are presented and discussed. ***D. F. Carr.*** *Journal of Photographic Science,* v. 6, no. 4, July-Aug. 1958, p. 107-111.

627* Color Proving Without a Press. I. Methods are available to do the job if some of the fine points are mastered. ***James M. Nolan.*** *National Lithographer,* v. 65, Oct. 1958, p. 14 + 2 pages.

628 Photographic Technique for Measuring Temperatures in Luminous Rocket Exhaust Flames. The theory of the two path-length method for optically determining flame temperature is reviewed, and the requirements for quantitative photographic measurement are presented. ***Frederick S. Simmons and Arthur G. DeBell.*** *Optical Society of America, Journal,* v. 48, Oct. 1958, p. 717-721.

629 Application of Inorganic Phosphors to Infrared Photography. The utilization of zinc cadmium sulfide phosphor plates is described. Radiation in the near and middle infrared, between 0.7 to 2.5 microns produces latent images on phosphors for subsequent visual observation or permanent photographic record. ***H. Kallmann and J. Rennert.*** *Optical Society of America, Journal,* v. 48, Nov. 1958, p. 812-815.

630* On the Quantum Efficiency of Photographic Negatives. The concept of detective quantum efficiency is considered in detail, and the quantum efficiency of four black and white negative films is computed from sensitometric and granularity data. ***R. Clark Jones.*** *Photographic Science and Engineering,* v. 2, no. 2, Aug. 1958, p. 57-65.

631* A Sensitometric Processing Machine Using Small Film Strips and Small Developer Volume. The processor comprises a series of tubes containing the film strips and the developer, fastened radially to a water-driven wheel. The force required to drive the wheel and invert the tubes is supplied by the tempering water, which is circulated through a pump. Its temperature is controlled by an appropriate heater, a cold water supply, and a thermoregulator. ***R. W. Henn and K. R. Hughes.*** *Photographic Science and Engineering,* v. 2, no. 2, Aug. 1958, p. 81-84.

632* Photographic Emulsions for Missile Photography. Nearly all the emulsions tested have adequate resolving power to handle the relatively poor image quality resulting from atmospheric turbulence. Color films, although quite useful for ranges up to 20 miles, rapidly lose their effectiveness as atmospheric haze reduces color saturation. ***Hutson K. Howell.*** *Photographic Science and Engineering,* v. 2, no. 2, Aug. 1958, p. 95-104.

633* Pleasing Color: Theory and Technique. II. Analysis of the technique of three-printer reproduction, plant operations, and factors in achieving the best results. ***Walter Douglas Munro.*** *Productionwise,* v. 12, no. 3, Sept. 1958, p. 60 + 4 pages.

634* Color Exposure for High-Speed Photography of Some Self-Luminous Events. Many problems encountered in high-speed photography of erratic self-luminous events, such as fires, flames, liquid metals and furnace interiors, can be overcome with lens attachments. A new approach to exposure calculation, using computed speed-characteristic curves of cameras, is explained and examples given. ***K. H. Lohse,*** *Society of Motion Picture and Television Engineers, Journal,* v. 67, Sept. 1958, p. 567-571.

635* Practical Film Cleaning for Safety and Effectiveness. The importance of good technique in film cleaning is emphasized. Possible cleaning solvents are classified on the basis of inertness to film, hazards to personnel, risk of fire, physical properties, and cleaning efficiency. ***D. W. Fassett, F. J. Kolb, Jr., and E. M. Weigel.*** *Society of Motion Picture and Television Engineers, Journal,* v. 67, Sept. 1958, p. 572-589.

636* A Method for the Evaluation of the Spectral Characteristics of Color Screens. The procedure involves the use of masks to block selectively the unwanted colors in order to allow spectrophotometric measurements to be made on the chosen color. ***Karl Weiss.*** *Society of Motion Picture and Television Engineers, Journal,* v. 67, Sept. 1958, p. 605.

637* Sensitometry of Photographic Layers Utilized in Obtaining Relief Images. Method developed for determination of height of a relief photo-image obtained by tanning chromogelatin layers and tanning development of silver halide layers. (*In Russian.*) Sensitometriia fotograficheskikh sloev, primeniaemykh dlia polucheniia rel'efnogo izobrazheniia. ***V. A. Veidenbakh and E. A. Karpovich.*** *Zhurnal Nauchnoĭ i Prikladnoĭ Fotografii i Kinematografii,* v. 3, no. 5, Sept.-Oct. 1958, p. 351-358.

See also: **366** (starches for coating adhesives); **604** (aerial photography and geomorphology); **669** (microfilming of drawings); **676** (reproduction in libraries).

HEAT POWER

638 Air Intake Problems in Supersonic Propulsion. Invited papers presented at the 11th AGARD Combustion and Propulsion Panel Meeting—Paris, December 1956. ***J. Fabri,*** editor. 82 pp. 1958. Pergamon Press, New York. (TL709.5.A3 N81.1a)

639 What Power Sources in Space? Man will probably have to carry along his own sources of power in the form of chemicals or nuclear reactors despite presence of meteoroids, cosmic rays, and solar radiation. ***John H. Huth.*** *Astronautics,* v. 3, Oct. 1958, p. 24 + 4 pages.

640 Solids Give Liquids a Boost. Compact and mechanically simple, solid propellant gas generators for pressurizing liquid propellant rocket motors. ***Jerome Salzman.*** *Astronautics,* v. 3, Oct. 1958, p. 30 + 2 pages.

641* Piston Ring Wear. The application of radiotracers to the measurement of engine wear in moving vehicles. ***J. H. Deterding and J. R. B. Calow.*** *Automobile Engineer,* v. 48, Oct. 1958, p. 378-381.

642 JT12 Design Geared to Permit Early Production Date. Design details of Pratt & Whitney's small turbojet engine point up the ruggedness, simplicity and proven engineering methods woven into the high performance, medium pressure ratio JT12. ***Robert I. Stanfield.*** *Aviation Week,* v. 69, Oct. 20, 1958, p. 56 + 4 pages.

643* The Development of the Gas Turbine for Industrial Use. A review of the growth and future prospects of this type of prime mover. ***B. W. Martin.*** *British Chemical Engineering,* v. 3, Oct. 1958, p. 546-551.

644 Design and Development of Engines for High-Speed Flight. Design and development of jets; air breathing engines; turbojets; ramjets; rockets; and mixed power plants. ***E. S. Moult.*** *Chartered Mechanical Engineer,* v. 5, no. 8, Oct. 1958, p. 366-378.

645* Steam-Jet Compressors as Heat Pumps. Heat pumps are suitable for filling gaps in power requirements. Steam-jet compressors which are suitable for heat pumps are described. (*In German.*) Dampfstrahlverdichter als Wärmepumpen. ***Th. Messing.*** *Chemie-Ingenieur-Technik,* v. 30, no. 9, Sept. 1958, p. 589-593.

646* Recovering "Wasted" Horsepower. The ingenious application of a special type of turbine is responsible for recovering a considerable amount of energy that once was lost. The power is put back into a petroleum-industry process as it is used to drive gas compressors. ***H. F. Smith.*** *Compressed Air Magazine,* v. 63, Oct. 1958, p. 24-25.

647* How to Predict Turbocharged Engine Performance With Varying Conditions. Extensive research results in set of reference curves for quickly determining how widely varying operating conditions will affect turbocharger-engine combinations. ***Rudolph Birmann and Ernest W. Blattner.*** *Diesel and Gas Turbine Progress,* v. 24, Oct. 1958, p. 42-44.

648* Some Results of Investigation of Deflections and Stresses in Welded Diaphragms of Steam Turbines. Some special features of calculation. Distribution of stresses in diaphragm blades. Three methods of calculation and comparison of the calculated maximum deflections and stresses in diaphragm elements with experimental data. The data indicate incompetence of the two most widespread methods of calculation. (*In Russian.*) O nekotorykh rezul'tatakh issledovaniaa progibov i napriazhenii v svarnykh diafragmakh parovykh turbin. ***N. D. Sentsov.*** *Energomashinostroenie,* v. 4, no. 8, Aug. 1958, p. 6-11.

649* Ashford Common Pumping Station. Three British gas turbines installed for emergency power in the Metropolitan Water Board's new establishment with three 1,100-kW diesel alternators for peak load lopping. *Gas and Oil Power,* v. 53, Sept. 1958, p. 227-235.

650* Swindon-Built Diesel-Hydraulic Locomotives. The first main line diesel hydraulic locomotive to be built in British Railways' own workshops has completed trials and has been put into service. *Gas and Oil Power,* v. 53, Sept. 1958, p. 236-239.

651 Rocket Working Fluids. Hydrogen and Helium. This discussion explores the performance potentialities of H and He as inert working fluids in a rocket using a separate heat source. ***Robert L. Potter, Gordon E. Guffner, and Thomas F. Reinhardt.*** *Industrial and Engineering Chemistry,* v. 50, Oct. 1958, p. 1557-1560.

652* Practical Experiences With the Use of Heavy Fuel Oil in Medium Speed Industrial Diesel Engines, Operated by the State Electricity Commission of Victoria. Fundamental principles of the use of heavy fuel oil in diesel engines. ***R. P. Kay and D. C. Cooper.*** *Institute of Marine Engineers, Transactions,* v. 70, Sept. 1958, p. 281-292.

653* Operating Experience With Gas Turbines. Information regarding operation and maintenance of industrial turbines from a number of sources. ***Leo Walter.*** *Mechanical World and Engineering Record,* v. 138, Oct. 1958, p. 466-467.

654 Design of a Quiet Diesel Power Station. Describes how various possible avenues of noise transmission were treated in order to meet the acoustical design criterion which had been established. ***Martin Hirschorn and A. Schiesser.*** *Noise Control,* v. 4, Sept. 1958, p. 12-18.

655* A Theory of the Cylindrical Ejector Supersonic Propelling Nozzle. A theory is presented of the ejector nozzle in which the secondary shroud is cylindrical, which is based on continuity, momentum and maximizing of the secondary flow. ***H. Pearson, J. B. Holliday, and S. F. Smith.*** *Royal Aeronautical Society, Journal,* v. 62, Oct. 1958, p. 746-751.

656* Investigation Into Mass Exchange in the Circulation Zone Behind a Body With the Main Flow and the Conditions of Mixing in This Zone. Consideration is given to some results of an experimental investigation in the zone of circulation of a body which is insufficiently swept over with a flow. The empirical relations of mass exchange in this zone with a flow are given for both cases with and without presence of burning in the zone. (*In Russian.*) Issledovanie massobmena zony tsirkuliatsii za plokho obtekaemym telom s osnovnym potokom i uslovii smesheniia v nei. ***S. M. Pavlov.*** *Teploenergetika,* v. 5, no. 10, Oct. 1958, p. 72-75.

657 Effect of Chord Size on Weight and Cooling Characteristics of Air-Cooled Turbine Blades. An analysis of shell-supported gas-turbine blades. ***Jack B. Esgar, Eugene F. Schum, and Arthur N. Curren.*** *U. S. National Advisory Committee for Aeronautics, Report* 1354, 1958, 13 pp. (TL521 Un3r Vis.)

658 Theory and Experiments on Supersonic Air-to-Air Ejectors. Proposes an elementary theory for interpretation of test performance of cylindrical mixers. ***J. Fabri and J. Paulon.*** *U. S. National Advisory Committee for Aeronautics, Technical Memorandum* 1410, Sept. 1958, 30 pp. (TL570 Un3tm Vis.)

659 The Trend to Larger Turbine Generators—and the Important Factors Concerned. Maximum turbine generator sizes have been increasing by leaps and bounds. The various problems and factors involved in large units are discussed. ***J. K. Dillard and C. J. Baldwin.*** *Westinghouse Engineer,* v. 18, no. 6, Nov. 1958, p. 162-166.

660 Gas Turbines for Electric Utility Systems. The industrial gas turbine has applications, both immediate and future, in the electric utility field. The potential advantages of combined steam and gas turbine cycles merit investigation. ***R. E. Strong and W. H. Ferguson.*** *Westinghouse Engineer,* v. 18, no. 6, Nov. 1958, p. 170-174.

See also: **15** (testing turbojet and turboprop engines); **21** (propulsion at high altitudes); **523** (process heat statistics); **705** (jet compressors).

INFORMATION—PREPARATION AND DISSEMINATION

661 Some Aspects of Searching in the Pharmaceutical Literature. Major factors in selecting sources to be searched; clues to definition of fresh terminology; problems peculiar to pharmaceutical literature such as data on new experimental drugs, toxicological data, theses and pharmacopoeias; foreign patents, Japanese literature, Russian antibiotic literature; and several types of special services. ***Harold Oatfield and Betty Reynolds Emilio.*** *American Documentation,* v. 9, no. 4, Oct. 1958, p. 238-272.

662 Review of Iron and Steel Literature for 1957. II. A selection of about 200 references. ***Esther Chesire.*** *Blast Furnace and Steel Plant,* v. 46, Oct. 1958, p. 1089 + 7 pages.

663 Education in Process Metallurgy. The best method of teaching process metallurgy is an analytical approach, based on a sound foundation of science and engineering principles. ***W. O. Philbrook.*** *Journal of Metals*, v. 10, Oct. 1958, p. 679-681.

664* The Exchange of Ideas in the Advancement of Knowledge. Proposes that librarians and scholars may by their own efforts promote the exchange of ideas. This study is an effort to provide better understanding of the issues met in such attempts. ***Howard W. Winger.*** *Library Quarterly*, v. 28, no. 4, Oct. 1958, p. 229-238.

665* The American Scholar and Barriers to Knowledge. Barriers encountered by the American scholar in his quest for knowledge and understanding of the peoples and the countries of eastern Europe. ***Douglas W. Bryant.*** *Library Quarterly*, v. 28, no. 4, Oct. 1958, p. 239-253.

666* Libraries and Bibliographical Projects in the Communist Bloc. In over-all organization, goals, and practices the libraries of the satellite nations are following a course that derives its inspiration and motivation from Moscow. ***Thomas J. Whitby.*** *Library Quarterly*, v. 28, no. 4, Oct. 1958, p. 277-294.

667* Russian Literature in the Natural Sciences. ***Everett C. Olson.*** *Library Quarterly*, v. 28, no. 4, Oct. 1958, p. 295-307.

668 Company Libraries Stretch R & D Funds. The library's role in making the dollar do more; search before you research is urged. ***Harold S. Sharp.*** *Product Engineering*, v. 29, no. 41, Oct. 6, 1958, p. 30.

669 Microfilm Pushes Drawings Aside. Miniaturization helps solve supervisory problems, and makes the job easier for the engineer. ***Walter J. Locke.*** *Product Engineering*, v. 29, no. 44, Oct. 27, 1958, p. 44-47.

670 Facets of the Technical Information Problem. A series of questions which serve as a helpful stimulus as well as a disciplinary aid in viewing the technical-information problem in its broadest dimensions. ***Charles P. Bourne and Douglas C. Engelbart.*** *Research & Engineering*, v. 4, Sept.-Oct. 1958, p. 6-12.

671* The Job of the Technical Writer. Contains a listing of major tasks and a job description for technical writing. *STWE Review*, v. 5, no. 4, Oct. 1958, p. 7-9.

672* Cartoons in Technical Manuals. Describes the mission of this "mightiest form of communication known to man". ***Dave Breger.*** *STWE Review*, v. 5, no. 4, Oct. 1958, p. 13-14.

673* A Glossary of Terms Used in the Detergents Industry. English, German, and French terms are listed, side by side. ***G. Carrière.*** *Soap, Perfumery & Cosmetics*, v. 31, Oct. 1958, p. 949-958.

674* Russian Abbreviations for Bibliographic Search. A translation of about 250 frequently used abbreviations and a clearly understood Russian alphabet. ***Eva Lou Fisher.*** *Special Libraries*, v. 49, no. 8, Oct. 1958, p. 365-370.

675* Measuring Performance in a Special Library—Problems and Prospects. ***Paul Wasserman.*** *Special Libraries*, v. 49, no. 8, Oct. 1958, p. 377-382.

676* Reproduction: An Integrated Function of the Technical Information Library. The reproduction function is best directed toward our primary purpose—dissemination of information—when it is integrated with all other functions. ***Loretta J. Kiersky.*** *Special Libraries*, v. 49, no. 8, Oct. 1958, p. 386-388.

See also: **379** (machine translation).

INSTRUMENTATION

677 Instrumentation—Where We Stand. A discussion of problem areas in instrumentation for measurement of high temperature, high pressure, direct force, and microwave quantities. ***Allen V. Astin.*** *ASTM Bulletin*, 1958, no. 232, Sept., p. 7-11.

678 Magnetic-Amplifier-Operated Ink Recorders. The paper presents detailed information on design and actual performance of high-precision magnetic instrument amplifiers exhibiting unusual stability of operation, linearity of the output-input characteristic, and freedom from zero drift. ***W. A. Geyger.*** *Communication and Electronics*, 1958, no. 38, Sept., p. 457-471.

679 Basic Gages and Gaging Considerations for Automatic Machine Control. The gages in the configuration of measuring equipment discussed are measuring devices indicating diameter, length, thickness, and so on. ***J. W. Hopper.*** *IRE Transactions on Industrial Electronics, PGIE-7*, Aug. 1958, p. 40-43. (TK1 In6.6ie Vis.)

680* The Basic Problem in an Automatic-Control Loop. The factors in the control loop which govern quality are defined, and the manner in which they affect it is analyzed by way of the step-function technique. ***M. A. Beechey.*** *Instrument Engineer*, v. 2, no. 6, Oct. 1958, p. 113-118.

681* Pneumatic Computation and Mass-Flow Measurement. A multiplying mechanism which enables the operations of multiplication and division and such allied operations as square-root extraction, to be performed pneumatically. ***E. D. Low.*** *Instrument Engineer*, v. 2, no. 6, Oct. 1958, p. 119-122.

682* An Electrical-Analog Method for Transient Heat-Flow Analysis. The instrument is of the so-called "fast-time" type, simulating the transient involved in times of the order of 10^{-6} that of the thermal prototype. Some applications of the instrument to the field of fire research are described. The discussion of errors includes consideration of those resulting from the lumping of circuit elements. ***A. F. Robertson and Daniel Gross.*** *Journal of Research, National Bureau of Standards*, v. 61, no. 2, Aug. 1958, p. 105-115.

683 A Permeameter Controller for Magnetic Measurements. Determination of the magnetic properties of materials by the ballistic method often involves complicated switching of the magnetizing currents. A semi-automatic controller has been built which carries out the switching operations and ensures the material is maintained in a cyclic magnetic state. The N.P.L. permeameter is also briefly described. ***M. J. Swan.*** *Journal of Scientific Instruments*, v. 35, Sept. 1958, p. 344-346.

684 Electronic-Recording, Time-Resolving Spectrometer. A photoelectric means for recording an extended spectral region as a function of time has been developed. With this method, the recording procedure imposes no limitations on the time resolution other than that defined by the minimum detectable energy. ***Per Gloersen.*** *Optical Society of America, Journal*, v. 48, Oct. 1958, p. 712-716.

685* Apparatus and a Laboratory for Processing Thick Nuclear Track Emulsions. Photographic studies in high-energy physics frequently utilize stacks of special emulsions 400 to 600 μ thick. These emulsions require specialized processing techniques, often involving temperatures as low as 5 C and development for as long as 96 hrs. Details of these procedures are given, including handling of the emulsion pellicles, temperature control, and description of the equipment. ***John F. Garfield.*** *Photographic Science and Engineering*, v. 2, no. 2, Aug. 1958, p. 85-90.

686* Soviet Electron Microscopes. A short description of industrial and laboratory models for direct investigation of solids by reflecting-, mirror-, screen-, and shadow-techniques. (*In Russian.*) Sovetskie elektronnye mikroskopy. ***In. M. Kushnir.*** *Pribory i Tekhnika Eksperimenta*, 1958, no. 4, July-Aug., p. 3-18.

687 Rapid High-Sensitivity Recording Thermometer. Describes a thermistor thermometer including the circuit details for the activation of the thermistor bridge circuit and associated amplifier. ***Richard W. Stow.*** *Review of Scientific Instruments*, v. 29, Sept. 1958, p. 774-775.

688* Cavity Type Micro-Cells for Infrared Spectrometry. Two types are described: for use with a Perkin-Elmer Model 21 spectrophotometer, and in conjunction with an infrared

micro-illuminator. ***R. Norman Jones and Armand Nadeau.*** *Spectrochimica Acta*, v. 12, nos. 2/3, Sept. 1958, p. 183-191 + 1 plate.

689* The Air Stream Sieve, a New Apparatus to Conduct Sieving Tests. The article describes a newly developed test sieve apparatus, by means of which the separation into fine and coarse material is effected with the aid of an air current, the streaming of which is guided in a certain way. The special advantage of this apparatus lies in the greatly shortened duration of the sieving operation. (*In German.*) Das Luftstrahlsieb, ein neues Gerät für die Durchführung von Prüfsiebungen. ***Otto Lauer.*** *Staub*, v. 18, Oct. 1958, p. 306-309.

LUBRICATION AND FRICTION

690 Theory of Oil Whip for Vertical Rotors Supported by Plain Journal Bearings. Shows that by considering the pressure forces, the viscous drag forces, and the centrifugal forces acting on the journal in a plain journal bearing in oil whip, it is possible to obtain a rational explanation of this phenomenon. ***Finn Orbeck.*** *ASME, Transactions*, v. 80, no. 7, Oct. 1958, p. 1497-1502.

691 Static and Dynamic Characteristics of Compensated Gas Bearings. A comparison is made between two common types of hydrostatic gas bearings—the pool bearing and the inherently compensated bearing—and a design example for a specific bearing requirement is worked. ***Herbert H. Richardson.*** *ASME, Transactions*, v. 80, no. 7, Oct. 1958, p. 1503-1509.

692 Fluid Pressure Pads Float Rotor, Eliminate Metallic Contact. Hydrostatic bearings support a grinding spindle rotor to prevent metal-to-metal contact between rotor and stationary bearings. The rotor is journalled on hydraulic fluid, and resists substantial radial and thrust loads hydrostatically. It is driven by twin tangential fluid jets. The design eliminates vibration, belt pull and radial loads. *Design News*, v. 13, Oct. 13, 1958, p. 46-47.

693 Importance of Pumpability and Heat Stability in Industrial Greases. Viscosity of oil is principal determining factor in pumpability of grease at low temperatures. ***Wm. A. Magie.*** *Iron and Steel Engineer*, v. 35, Oct. 1958, p. 87-91.

694 Frictional Properties of TFE Fluorocarbon Resins. Data and discussion show that Teflon's coefficient of friction varies significantly with load, sliding speed and temperature. ***A. J. G. Allan and F. M. Chapman.*** *Materials in Design Engineering*, v. 48, Oct. 1958, p. 106-108.

695 Selecting Sleeve Bearing Materials. Materials in Design Engineering Manual No. 153 covers properties and selection of bearing materials. ***Richard Booser.*** *Materials in Design Engineering*, v. 48, Oct. 1958, p. 119-130.

696* Friction and Lubrication of Machine Slides. A friction and lubrication study to provide design data for the slideways of machine tools. ***T. M. Birchall and A. I. W. Moore.*** *Metalworking Production*, v. 102, no. 38, Sept. 19, 1958, p. 1639-1645.

697 Proceedings of the Conference on Lubrication and Wear, October 1-3, 1957. 911 pp. 1957. The Institution of Mechanical Engineers, London. (TJ1075 C76p Over.)

698 Recent Research on Hydraulic Seals. A consideration of the problems of sealing in the lubrication of bearings of turbine shafts. ***D. F. Denny.*** *Scientific Lubrication*, v. 10, Sept. 1958, p. 12-17.

699 Grease Bleeding, Its Mechanisms & Measurement. Stresses oil loss from lubricating greases, whether in storage or in use. ***E. G. Ellis.*** *Scientific Lubrication*, v. 10, Sept. 1958, p. 20 + 5 pages.

700 Development of Radiation Resistant Oils. The objective of this work was to develop oils of maximum radiation stability from readily available ingredients. Lubricants in three viscosity grades were made from an alkylbenzene containing select polymers and inhibitors. Each new oil was subjected to standard tests to determine if it met the specifications for presently used mineral oils. ***J. G. Carroll, R. O. Bolt, and S. R. Calish.*** *U. S. Atomic Energy Commission, AECU-3764*, June 16, 1958, 38 pp. (UF767 U3au Contin.)

See also: **641** (piston ring wear); **724** (rubber-seated valves); **1153** (refrigeration lubricants).

MECHANICAL ENGINEERING

701 Symposium on Laboratory Testing of Hydraulic Turbine Models in Relation to Field Performance. This report includes, in full, the five prepared statements by representatives of the major American manufacturers and, in condensed form, the written and oral discussions presented at the 1956 Annual Meeting. *ASME, Transactions*, v. 80, no. 7, Oct. 1958, p. 1525-1543.

702 The Shear Modulus of Foil Honeycomb Cores. Simple expressions for upper and lower limits to the shear modulus of honeycomb sandwich cores are obtained by application of the Unit Displacement and Unit Load methods in conjunction with simplifying assumptions as to the strain and stress systems respectively in the core. The theory is given for cores built up from foil ribbons to form cells of general honeycomb form. Test methods for the experimental determination of the shear modulus are also discussed. ***S. Kelsey, R. A. Gellatly, and B. W. Clark.*** *Aircraft Engineering*, v. 30, Oct. 1958, p. 294-302.

703* Folded Plate Dome Ideal for Auditorium. Design and construction of a folded plate concrete roof over an auditorium at Wayne, Mich., are discussed. Dimensions, design loading, decentering procedure, and deflection are described. ***Lyndon Welch.*** *American Concrete Institute, Journal*, v. 30, no. 4, Oct. 1958; *ACI Proceedings*, v. 55, p. 441-446.

704* Folded Slab Construction. Discusses design principles for folded concrete slab roofs, stair landings, and galleries, with special attention to shear forces and to stresses produced by differential deformation in the slabs. Beam action of the fold or "quoin" is explained. Precast elements, prestressing, and composite construction (precast with cast-in-place concrete) are shown as they apply to folded slab construction. Structures in England and America illustrate use of folded slabs in a wide variety of shapes. ***Felix J. Samuely.*** *American Concrete Institute, Journal*, v. 30, no. 4, Oct. 1958; *ACI Proceedings*, v. 55, 1958, p. 447-460.

705* Jet Compressors. Discusses the design; the types; the history and development, and the applications and limitations of jet compressors. ***N. B. Hammond.*** *American Gas Journal*, v. 185, Oct. 1958, p. 31-35.

706 Engineering Meteorology: Wind Effects on Motor Stability. The primary conditions under which the single meteorological parameter of wind will make its presence known against a motor vehicle are considered. The standard engineering techniques for reducing the undesirable effects of the car are discussed. ***William Benner.*** *American Meteorological Society, Bulletin*, v. 39, Aug. 1958, p. 421-426.

707* Aircraft Reliability Demands Leakproof Hydraulics. In designing aircraft hydraulic systems for high reliability, the prevention of fluid leakage is one of the most important factors. Connections must be 100% foolproof on installation both in the factory and in the field. ***E. T. Raymond and J. W. Hull.*** *Applied Hydraulics and Pneumatics*, v. 11, Oct. 1958, p. 74-77.

708* The Onset of Yield in a Thick Spherical Shell Subject to Internal Pressure and Uniform Heat Flow. The elastic stresses due to internal pressure and uniform heat flow are quoted separately and it is shown that, in each case, yield occurs first at the inside radius. ***M. G. Derrington and W. Johnson.*** *Applied Scientific Research, Sec. A, Mechanics, Heat, Chemical Engineering, Mathematical Methods*, v. 7, no. 6, 1958, p. 408-420.

709* On the Torsional Characteristics of a Shaft With Multi-Symmetrical Curved Boundary. Derivation of Stress-Deformation Relationships. ***D. R. Axelrad and A. Reichel.*** *Australian Journal of Applied Science*, v. 9, no. 3, Sept. 1958, p. 216-224.

710* Aerodynamic Drag. An analysis of the factors that affect passenger car design. ***R. M. Ogorkiewicz.*** *Automobile Engineer*, v. 48, Oct. 1958, p. 397-399.

711 Design and Operation of Saginaw Power Steering Gear for 1959 Cars. The new rotary valve type, integral power steering gear is said to meet the objectives visualized for many years, i.e., to combine the positive response of the manual gear with the smoothness and lightness of a power gear. *Automotive Industries*, v. 119, no. 7, Oct. 1, 1958, p. 48 + 2 pages.

712* Investigation of Unsteady Operating Conditions in a Transparent Hydrotransformer. Theoretical study. (*In Russian.*) Issledovanie neustanovivshikhsia rezhimov raboty prozrachnogo gidrotransformatora. ***Chzhuan Tszi-De.*** *Avtomobil'naia Promyshlennost'*, 1958, no. 8, Aug., p. 9-17.

713 Internal Manifold-Type Circuitry Eliminates Piping. Manifold-type circuitry replaces the standard piping and valves to lower cost in a line of small hydraulic power units, called "Circuitpak". *Design News*, v. 13, Oct. 13, 1958, p. 32-33.

714 Stresses in Rotating Thin Plates With Curvilinear Boundaries. The problem of curvilinear plates rotating at constant speed about an axis in the plane of the plate is considered. ***G. M. Arkilic.*** *Franklin Institute, Journal*, v. 266, no. 4, Oct. 1958, p. 279-292.

715* New Look in Peak Load Compression. Unitization of compressor units, acoustical treatment, pre-heating system for quick starting, and safety provisions are key features of modern $4,650,000 compressor station. ***W. H. Krammes and H. C. Vander Heyden.*** *Gas Age*, v. 122, Oct. 16, 1958, p. 36 + 5 pages.

716 Advanced Approach Simplifies Piping Flexibility Analysis for Process and Power Piping Systems. The application of high speed electronic digital computers, such as the IBM 650 unit in piping design. ***Edwin A. Wert.*** *Heating, Piping & Air Conditioning*, v. 30, Oct. 1958, p. 86-88.

717* Elimination of Vibration in Diesel Engine Transmission Systems. Marine transmission shafting presents problems of special and varying nature due to the incidence of torsional vibrations. It was found necessary to have a greater degree of torsional flexibility between the engine and the transmission coupled with powerful damping. A new coupling incorporating these characteristics was developed. ***G. Hallewell.*** *Institute of Marine Engineers, Transactions*, v. 70, Sept. 1958, p. 293-297.

718 Filtering Hydraulic Circuits. II. Filtration principles; filter types. ***Jaroslav J. Taborek.*** *Machine Design*, v. 30, Oct. 2, 1958, p. 128-134.

719 Some Remarks on the Fundamentals of Structural Safety. Advocates establishing the ultimate load as the product of a factor of safety slightly above unity and a "standard load". ***A. van der Neut.*** *North Atlantic Treaty Organization, AGARD Report No.* 155, Nov. 1957, 20 pp. (TL565 Ag11r Vis.)

720* Philosophy of Telecontrol of Reciprocating Gas Engine Compressors. ***F. Vinton Long.*** *Pipe Line News*, v. 30, Oct. 1958, p. 39-48.

721* Tips on Selecting the Proper Air Compressor. Brief evaluations of the two principal compressor types—positive displacement (reciprocating and rotary) and dynamic types (centrifugal and axial flow)—are made to help in proper selection for specific conditions. Pointers are also given on starting, inspection, and lubrication. ***Edmond C. Powers.*** *Plant*, v. 18, Oct. 1958, p. 37-39.

722 Roberts' Law Helps You Find Alternate Four-Bar Linkages. For every linkage there are two substitutes that will produce the same desired motion. Author furnishes three examples, including his own method of applying the law. ***R. T. Hinkle.*** *Product Engineering*, v. 29, no. 44, Oct. 27, 1958, p. 54-55.

723 Method for Analyzing Vibration at a Surface Point. The closed path (trajectory) traversed by a point on a vibrating surface is described in terms of two components normal to each other and contained in a plane perpendicular to the surface. Phase and amplitude of the component signals are measured with a double-beam oscilloscope so that a motion map of the vibrating surface can be made. ***J. S. Arnold and J. G. Martner.*** *Review of Scientific Instruments*, v. 29, Sept. 1958, p. 779-783.

724* Rubber-Seated Butterfly Valves. How to select the proper size butterfly valve, and the operating torque characteristics involved. ***A. E. Hatch, Jr. and W. H. Chamberlain.*** *Water & Sewage Works* (Reference Number), v. 105, Sept. 15, 1958, p. R-173–R-180.

See also: **17** (honeycomb panel construction); **517** (plant design); **880** (design characteristics of sinterings).

METALLURGY

725 The Metallurgy of Boron Structural Steels. Data on variation of hardenability, austenite grain size, and mechanical properties, especially impact strength, with increasing B contents. Best final deoxidizing practice for minimizing the harmful effects of B; effect of small additions of V on B recovery and boron steel properties; beneficial action of Ti added in small amounts to bind N. ***O. N. Meshcherinova, L. I. Posysaeva, and G. A. Khasin.*** *Henry Brutcher Translation No.* 4256, 16 pp. (From *Stal'*, v. 18, no. 1, 1958, p. 75-81.) Henry Brutcher, Altadena, Calif.

726 The Design of Heat-Treatable Titanium Alloys. A partial 900 C isothermal section of the Ti-Al-Mo constitutional diagram, including ternary tie-lines, was developed and a system for the design of heat-treatable alloys based on this isothermal section was examined. Using the criterion of tensile properties, this system involves the choice of the best β composition available on solution treatment at 900 C and the addition to it of controlled amounts of α of a fixed composition using the tie-lines as a guide. ***A. J. Williams.*** *Canada, Mines Branch, Research Report*, R-11, June 4, 1958, 26 pp. (TN26 C16.5r Contin.)

727 Special Report on Ductile Iron. Combines the low cost, machinability and process advantages of cast iron with the strength, ductility and wear resistance of steel. Properties of six types are tabulated. *Design News*, v. 13, Sept. 29, 1958, p. 14-15.

728* Titanium and Its Alloys. Popular versions of the theories of metals and of alloys and how Ti and its alloys fit in. Applications for Ti. ***M. K. McQuillan.*** *Discovery*, v. 19, Oct. 1958, p. 427-432.

729 Gold in Silicon. In the present experiments, Au has been found to be introduced during heat treatments in concentrations sufficient to account for the observed changes in the electrical characteristics. Gold has been observed on the surfaces of all the Si samples examined so far. Heat treatments in the temperature range 1100-1300 C result in a concentration of Au in the bulk material of about 10^{14} at/cm^3. ***G. Bemski and J. D. Struthers.*** *Electrochemical Society, Journal*, v. 105, Oct. 1958, p. 588-591.

730 Less Common Metals. Reactive metals can be made more resistant to high temperature oxidation by alloying and the development of impervious, well-bonded protective surface coatings. The best progress has been made in protective coatings for Mo. Th most promising work with Nb has been based on alloying. Special alloys of Zr, Ta, and Nb have been developed for the somewhat unusual corrosive and other inimical conditions prevalent in nuclear reactors. ***E. M. Sherwood.*** *Industrial and Engineering Chemistry*, v. 50, Sept. 1958, pt. 2, p. 1455-1459.

731 Ductile Vanadium. A New Engineering Material. Pure V is soft and ductile, has a relatively low neutron cross-section and excellent corrosion resistance, but the metal oxidizes readily above 1225 F. Titanium appears to be the most promising alloying element for improving the strength of V-base alloys, both at room and at elevated temperatures. ***T. W. Merrill.*** *Journal of Metals,* v. 10, Sept. 1958, p. 618-621.

732 Germanium, Zinc's Important Byproduct. Describes the processes involved in production of Ge. ***Theophile Boving and Jean Andre.*** *Journal of Metals,* v. 10, Oct. 1958, p. 659-661.

733 High Temperature Metals. A summary of subjects discussed at a symposium on "The Study of Metals and Alloys above 1200 C" held at the Oxford University Department of Metallurgy. *Metal Industry,* v. 93, Oct. 10, 1958, p. 309-310.

734 New Magnetic Steel. A new kind of magnetic steel called "Cubex" described as "doubly-oriented Si-Fe", or "cube-oriented Si-Fe" is expected to be used in the magnetic cores of electrical devices such as transformers, motors, and other electrical equipment. *Metal Treatment and Drop Forging,* v. 25, Aug. 1958, p. 314.

735* Chain Link Fencing. Aluminum's better looks, lower cost of upkeep, easier handling counted on to squeeze zinc-coated steel out of promising markets in business, industry, parks, and homes. ***Kim Darby.*** *Modern Metals,* v. 14, no. 8, Sept. 1958, p. 38 + 2 pages.

736* Carrying the Ball for Titanium. Four new Ti alloys MST 2½ Al-16V, MST821, MST185, MST3 Al-2½V developed by Mallory-Sharon Metals Corp. and three, B120VCA, C105VA, and C115AmoV, by Crucible Steel Company of America have improved mechanical properties. *Modern Metals,* v. 14, no. 9, Oct. 1958, p. 66 + 2 pages.

737* Breakthrough for Aluminum in Home Building. Shatters cost barrier and offers new line of Al covered homes at same prices as models sheathed with conventional materials. Up to 1½ tons of Al in revolutionary Viking homes. ***F. L. Church.*** *Modern Metals,* v. 14, no. 8, Sept. 1958, p. 74 + 2 pages.

738 The Properties and Applications of Rhenium. The metallurgical behavior of Re points the way to important small-volume applications, particularly in the fields of electricity and electronics. It can be fabricated by powder metallurgical techniques. Attempts at hot-working hat been unsuccessful, but cold working is feasible if reduction is gentle at first, followed by more extensive reductions. ***C. T. Sims and R. I. Jaffee.*** Paper from "Proceedings of the 1956 Regional Conference on Reactive Metals". p. 67-72. American Institute of Mining, Metallurgical, and Petroleum Engineers. (TN798 Am35.5p).

739 Advances in the Physical Metallurgy of Uranium and Its Alloys. Objectives are to gain a better understanding of the structure and metallurgical behavior of the pure metal free from the usual contaminants by studies on single crystals. In the alloy field the primary impetus is to improve the two properties that are of greatest concern in the utilization of U as a fuel-element base material—the dimensional stability and corrosion resistance. ***H. H. Chiswik, et al.*** *Second International Conference on the Peaceful Uses of Atomic Energy, Geneva, Sept. 1958, Paper* P/713, 35 pp. (QC770 In8a2 Contin.)

740 Copper and Its Alloys. Trends in production, uses, and fabrication. *Steel,* v. 143, Oct. 27, 1958, p. 75-90.

741 Technology of Columbium (Niobium). Owing to the rapid strides made in recent years in the field of high temperature technology and the growing need for materials having high strength at elevated temperatures, interest has developed concerning various of the less common metals for such applications. Columbium is such a metal and has much to offer for the designer of structures destined to operate at high temperatures. Recent and current research efforts on properties, the supply situation, extractive process metallurgy, analysis, effect of gases, alloy studies, and related subjects are reviewed. ***B. W. Gonser and E. M. Sherwood, editors.*** 120 pp. 1958. John Wiley & Sons, New York. (TN799.N7 EL25t Over.)

742* The Journal of the Iron & Steel Institute of Japan. Preprints for the 56th Grand Lecture Meeting of the Iron and Steel Institute of Japan. Papers have charts and tables with English captions. (*In Japanese.*) *Tetsu to Hagane (Journal of the Iron and Steel Institute of Japan),* v. 44, no. 9, Sept. 1958, 233 pp.

743 "Pin-Cushion" Irradiation Tests of Uranium and Its Zirconium Alloys. An irradiation test of 1/16 in. diameter x 3/16 in. long U^{235} and U^{235} -Zr alloy specimens, in the range 2 to 20 w/o Zr, is described. The small pins were mounted in heat transfer blocks, or "cushions", in such a way that surface roughening and length changes could be observed, recorded, and compared for five stabilizing heat treatments up to exposure levels of approximately 1% total atom burnup. ***S. H. Paine and F. L. Brown.*** *U. S. Atomic Energy Commission, ANL-5538,* July 1958, 41 pp. (UF767 Un3.1an Contin.)

744 "Pin-Cushion" Irradiation Tests of Uranium-Chromium Alloys. Irradiation tests on small pins of wrought and heat-treated U^{235}-Cr alloys mounted in special heat transfer blocks or "cushions" are described. Three compositions, estimated at 0.03, 0.07 and 0.22 w/o Cr, were tested in three metallurgical conditions: alpha-annealed, beta-quenched, and isothermally transformed. ***S. H. Paine and F. L. Brown.*** *U. S. Atomic Energy Commission, ANL-5854,* July 1958, 21 pp. (UF767 Un3.1an Contin.)

745 Survey of Ternary and Quaternary Metastable Gamma-Phase Uranium Alloys. A survey of the effects of ternary and quaternary alloying on the stability and properties of U-Zr, -Nb, and -Mo-base γ-phase alloys was conducted. The effects of ternary and quaternary additions of Cr, Mo, Nb, Ru, V, and Zr on transformation kinetics and temperature, hot hardness, and corrosion resistance were investigated. ***Victor W. Storhok, Arthur A. Bauer, and Ronald F. Dickerson.*** *U. S. Atomic Energy Commission, BMI-1278,* July 15, 1958, 36 pp. (UF767 U3b Contin.)

746* Production, Properties and Possibilities of Application of a High Purity (99.999%) Aluminum. Conditions of production. Disadvantage of graphite electrodes in refining batteries. Cells with metallic connection and application to the production of very highly pure Al. Colorimetric method to determine impurities in such Al. Properties. (*In German.*) Erzeugung, Eigenschaften und Verwendungsmöglichkeiten von Reinstaluminium mit einem Reinheitsgrad von 99.999%. ***Hans Schmitt, Walter Koch, and Ernst A. Bloch.*** *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 11, Sept. 1958, p. 427-432.

See also: **8** (high-strength steels for aircraft); **515** (research in metals marketing); **521** (economic aspects and supply situation for Cb); **662** (1957 iron and steel literature review); **663** (process metallurgy teaching methods); **870** (steel metallurgy).

METALS—CORROSION

747 Behavior of Carbon and Stainless Steels in Acid Waters. *R. J. Schmitt.* *Corrosion,* v. 14, Oct. 1958, p. 15.

748 Current and Potential Relations for the Cathodic Protection of Steel in Salt Water. A laboratory investigation was made pertaining to the cathodic protection of steel specimens that were exposed for 60 days to both stagnant and aerated city water, to which was added 3% by weight of NaCl. Major consideration was given to the significance of potential as a criterion for protection. ***W. J. Schwerdtfeger.*** *Corrosion,* v. 14, Oct. 1958, p. 16-20.

749 Processes of Electrochemical Corrosion. Theoretical considerations involved in determining the potential of H and O electrodes are reviewed briefly. Overvoltage is discussed in detail. The various connected stages involved in the process of the passage of ions into solution are outlined. ***G. V. Akimov.*** *Corrosion,* v. 14, Oct. 1958, p. 33-53.

750 The Corrosion Resistance of Ductile Iron. The internal structure of ordinary grey iron, pearlitic ductile iron, ferritic ductile iron, malleable iron and mild steel are compared. It is concluded that ductile iron has satisfactory corrosion resisting properties which permit its use where grey iron, malleable iron, or steel are regularly employed. ***F. L. LaQue.*** *Corrosion*, v. 14, Oct. 1958, p. 55-62.

751 High-Temperature Hydrogen Sulphide Corrosion in Refinery Experience. High-temperature corrosion by H_2S is a new problem in refinery technology. It is associated with catalytic reforming and desulphurization processes which were introduced during the last 5-7 years. ***P. W. Sherwood.*** *Corrosion Technology*, v. 5, Oct. 1958, p. 326-329.

752 An Investigation of Chemical Variables Affecting the Corrosion of Copper. In the presence of excess O the corrosion rate of Cu is a linear function of H ion concentration for each of three anions ($SO_4^=$, Cl^-, $C_2H_3O_2^-$). ***W. D. Robertson, V. F. Nole, W. H. Davenport, and F. P. Talboom, Jr.*** *Electrochemical Society, Journal*, v. 105, Oct. 1958, p. 569-573.

753 Room Temperature Tarnishing of Silver in Bromine and Iodine. Pure Ag was tarnished in an atmosphere of I and Br vapor at room temperature. This resulted in impervious halide surface layers, from which tarnishing rates could be deduced by means of a photomicrographic technique. It was found that the parabolic rate law, with diffusion being the rate-determining step, also holds at room temperature. The presence of water vapor reduces the rate of halogenation by a factor of two. ***Joseph L. Weininger.*** *Electrochemical Society, Journal*, v. 105, Oct. 1958, p. 577-581.

754 Selective Oxidation of Al From an Al-Fe Alloy. The selective oxidation of Al from a 4.8 wt % Al-Fe alloy was studied with a microbalance at temperatures of 700-900 C. The oxidizing gas was damp H_2, with dewpoints ranging from −55 to 0°C. The oxidation product was identified by electron diffraction to be the crystalline spinel, γ-Al_2O_3. At 800 C the parabolic oxidation constant was approximately proportional to the 1/7th power of the H_2O/H_2 gas ratio, and the experimental activation energy for the over-all oxidation reaction with 0°C dewpoint H gas was 72 kcal/mole. ***Richard E. Grace and Alan U. Seybolt.*** *Electrochemical Society, Journal*, v. 105, Oct. 1958, p. 582-585.

755* Increasing the Acid Resistance of Stainless Steels. Influence of additions of Pt metals. *Platinum Metals Review*, v. 2, no. 4, Oct. 1958, p. 117-119.

756 Corrosion and Creep Behavior of Tantalum in Flowing Sodium. The corrosion behavior of commercial Ta in high-purity flowing Na from 700 to 1200 F and the effect of Na exposure on the creep strength of Ta at 1200 F have been investigated. The tests were conducted in forced-convection flow loops constructed of Type 316 stainless steel. ***Gilbert E. Raines, C. Vernon Weaver, and John H. Stang.*** *U. S. Atomic Energy Commission, BMI*-1284, Aug. 21, 1958, 24 pp. (UF767 U8b Contin.)

757 Corrosion by Solutions Containing HNO_3, HF, and Reducing Agents. Mixtures of HNO_3 and HF that contained hydroxylamine nitrate, sulfamic acid, and ascorbic acid were used for corrosion of Types 304L and 309Cb stainless steel. Methods of decreasing corrosion were found. ***M. L. Holzworth.*** *U. S. Atomic Energy Commission, DP*-284, May 1958, 24 pp. (UF767 Un3.1dp Contin.)

See also: **344** (protective coatings for welds); **593** (effect of O on corrosion by oil-field brine); **1086** (plastics for corrosion control).

METALS—EXTRACTION AND REFINING

758 Recent Developments in Iron Smelting and Steelmaking Processes. ***W. M. Armstrong.*** *Canadian Mining and Metallurgical Bulletin*, v. 51, no. 557, Sept. 1958, p. 574-576; *Canadian Institute of Mining and Metallurgy, Transactions*, v. 61, 1958, p. 324-326.

759 Modern Blast Furnace Operation. The use of oxygen, moisture and high top pressure. ***J. H. Strassburger.*** *Iron & Steel*, v. 31, no. 11, Oct. 1958, p. 491-496.

760 Some Uses of Oxygen in Steelmaking. Converter, L-D, Kaldo and Rotor Processes. ***A. G. Raper and K. H. Hoyle.*** *Iron & Steel*, v. 31, no. 11, Oct. 1958, p. 499-503.

761 Carbon Black in Fuel Oil for Open Hearth Furnaces. An improvement of about 1.5% for each per cent of C added. Production runs were made on small open hearth furnaces using a light fuel oil in a 50% oil and 50% natural gas flame. ***G. W. Teskey, Jr.*** *Iron and Steel Engineer*, v. 35, Oct. 1958, p. 71-77.

762 Accelerated Firing Rates in Open Hearth Furnaces. Resulted in increased production of steel, far above that contemplated by the furnace builder. ***E. T. W. Bailey.*** *Iron and Steel Engineer*, v. 35, Oct. 1958, p. 124-128.

763 Converter Practice at La Sambre. (Translated from the French.) Both oxygen-steam and oxygen-carbon-dioxide blowing practice are used on an industrial scale to produce low-nitrogen, basic-bessemer steel at this Belgian mill. ***M. Demarez.*** *Journal of Metals*, v. 10, Oct. 1958, p. 669-672.

764 LD Produces Alloy Steels in Austria. Techniques for applying the LD converter to high-carbon steel production were derived during rail steel manufacture at the Donawitz plant of Osterreichisch Alpine Montangesellschaft. They are described here along with examples of various grades of high-carbon alloy steel produced by the process. ***O. Cuscoleca and K. Rosner.*** *Journal of Metals*, v. 10, Oct. 1958, p. 673-678.

765* Contribution to the Metallurgy of the Low Shaft Furnace. Combination of Mn with Si reduction by means of the $K_{Mn,Si}$ index; applicability of the $K_{Si,S}$ index to the explanation of desulfurization processes; and processing measures designed to improve desulfurization in the interior of the furnace. (*In German.*) Beitrag zur Metallurgie des Niederschachtofens. ***Karl-Friedrich Lüdemann.*** *Neue Hütte*, v. 3, Sept. 1958, p. 523-533.

766* Production of High Purity Nickel. High vacuum techniques; Hybinette, Mond, and high pressure processes; H pressure reduction; cleaning methods; electrolytic operation; analytic determination of impurities. (*In German.*) Herstellung von Nickel hoher Reinheit. ***Konrad Georgi and Eberhard Merkel.*** *Neue Hütte*, v. 3, Sept. 1958, p. 553-561.

767* Reduction of Iron Oxides in a Bed at High Pressure of the Gas Phase. The application of high pressure in a blast furnace should increase the speed and rate of indirect reduction in the zones of temperatures already studied. (*In Russian.*) Vosstanovlenie okislov zheleza v sloe pri vysokom davlenii gazovoĭ fazy. ***A. S. Tumarev and L. A. Paniushin.*** *Stal'*, v. 18, no. 9, Sept. 1958, p. 769-776.

768* New Designs for Cooling the Blast-Furnace Lining. Full-scale testing a thin-walled furnace shaft with surface plate coolers, vertical plate coolers with cells for crust formation for the boshes, cooling devices of improved design for the lower part of a blast furnace, tuyeres and furnace hearth bottom. (*In Russian.*) Novye konstruktsii dlia okhlazhdeniia domennoĭ pechi. ***S. M. Andon'ev, G. A. Kudinov, and O. V. Filip'ev.*** *Stal'*, v. 18, no. 9, Sept. 1958, p. 776-780.

769* Investigation of the Thermal Performance of a 500-Ton Open-Hearth Furnace. (*In Russian.*) Issledovanie teplovoĭ raboty 500-t martenovskoĭ pechi. ***V. S. Kocho, V. I. Grankovskii, and E. A. Ploshchenko.*** *Stal'*, v. 18, no. 9, Sept. 1958, p. 782-788.

770* Choosing the Main Parameters of the Electro-Magnetic Stirrer for an Arc Furnace. When the main parameters of the electromagnetic stirrer of an arc furnace are chosen properly the operation of the furnace is relieved considerably and the rate of power consumption reduced (capital cost of the installation is offset in 1.5–2 years). (*In Russian.*) Vybor nekotorykh parametrov dugovogo statora elektromagnitnogo peremeshivatelia zhidkoĭ stali. ***N. S. Siunov, M. G. Rezin, A. I. Kholodov, and I. G Osykhovskii.*** *Stal'*, v. 18, no. 9, Sept. 1958, p. 802-807.

771* The Influence of Oxidizing Roasting and Screen Analysis of Titanium Concentrates on the Rate of Titanium Recovery. Application of the preliminary oxidizing roasting of Ti concentrates provides an increase in the rate of Ti recovery up to 76.7% with corresponding reduction of the Al consumption rate and improvement of quality of this alloy. (*In Russian.*) Vliianie okislitel'nogo obzhiga i sitovogo sostava titanovykh kontsentratov na izvlechenie titana. ***P. F. Snezhko and I. S. Kumysh.*** *Stal'*, v. 18, no. 9, Sept. 1958, p. 808-812.

772 Uranium Recovery From Slag by Fluoride Volatilization. A Process Proposal. Technical feasibility of a fluoride volatility process for recovering U from MgF_2 slag was demonstrated on a laboratory and pilot plant scale. Two possible process routes were studied: (1) direct fluorination of slag, and (2) pretreatment of the slag by roasting, reduction, and hydrofluorination prior to fluorination. ***R. M. Edwards, J. A. Kennelley, and E. F. Sanders.*** *U. S. Atomic Energy Commission, MCW-1418*, Sept. 15, 1958, 30 pp.

773* Industrial Frequency Induction Furnace for Annealing Copper Pipes Before Cold Bending Process. Design and performance of an industrial frequency (50 cycles) induction furnace for annealing Cu pipes up to 220 mm. in diameter and 5000 mm. long. Properly operated furnace can work without repair an uniimited time, while a resistance furnace often breaks down due to burning out of heating elements. The cost of a 126 kw induction furnace is as low as 1/6 of the cost of a resistance furnace of same size. (*In Russian.*) Induktsionnaia pech' promyshlennoĭ chastoty dlia otzhiga mednykh trub pered kholodnoĭ gibkoĭ. ***I. K. Koyplov.*** *Vestnik Mashinostroeniia*, v. 38, no. 9, Sept. 1958, p. 34-35.

See also: **136** (water economy in iron and steel works); **751** (corrosion by H_2S in refinery); **790** (vacuum melting furnace).

METALS—FINISHING, POLISHING, AND CLEANING

774 The Reduction of Passive Films by Hydrogen Diffusion Through Steel. An experimental technique is described wherein the diffusion of hydrogen through a steel specimen is followed by electrode-potential measurements. In this technique, one surface of the specimen is exposed to acid and the other surface to a sodium dichromate solution. As the hydrogen produced by acid attack at the steel surface diffuses to the other surface, the potential of the surface in contact with the $Na_2Cr_2O_7$ solution changes with time, and changes of potential ranging from 300 mv to 900 mv are observed. It is believed that the observed potential changes result from the reduction of the dichromate-produced passive film by diffused hydrogen. The effect of variations in steel composition and thickness, acid composition and concentration, and sodium dichromate concentration on the phenomenon is reported. ***R. T. Davis, Jr. and T. J. Butler.*** *Electrochemical Society, Journal*, v. 105, Oct. 1958, p. 563-568.

775 Automatic Parts Washer at Ford Motor Co. Plant. The use of specially designed work holders, each one holding as many as 23 items, helped to solve a very difficult cleaning problem. ***Emil J. Frundel.*** *Industrial Finishing*, v. 34, no. 12, Oct. 1958, p. 54-56.

776 Surface Finish. Metallurgical and Mechanical Aspects. The various expressions used in the study of surface finish are described, together with the more important machine and material variables which affect them. ***K. G. Lewis.*** *Metal Treatment and Drop Forging*, v. 25, Sept. 1958, p. 377-384.

777 Vibratory Finishing. Through the proper application of vibratory motion, barrel finishing (without rotation) can be speeded up markedly. *Precision Metal Molding*, v. 16, Oct. 1958, p. 69-70.

METALS—FOUNDRY PRACTICE

778* Effect of Ultrasound Frequency Elastic Oscillation on the Process of Degasification of Aluminum Alloys. Utilization of 20 cycles in dehydrogenation of Al-Cu-Mg-Si alloy at 720 to 730 C in about 5 minutes. (*In Russian.*) O vozdeĭstvii uprugikh kolebaniĭ ul'trazvukovoĭ chastoty na protsess degazatsii aliuminievykh splavov. ***M. B. Al'tman, D. V. Vinogradova, V. I. Slotin, and G. I. Eskin.*** *Akademiia Nauk SSSR, Izvestiia, Otdelenie Tekhnicheskikh Nauk*, 1958, no. 9, Sept., p. 25-30.

779* Shell Mold Foundry Mechanized by Conveyor Systems. *Automation*, v. 5, Oct. 1958, p. 73-74.

780 Economic Design of Light Alloy Castings. ***P. A. Broadbent.*** *Chartered Mechanical Engineer*, v. 5, no. 8, Oct. 1958, p. 360-361.

781 Technique for Preserving Lifetime in Diffused Silicon. If, prior to diffusion, a suitable gettering agent is formed on the surface of a Si slice, then the resultant average lifetime is approximately an order of magnitude greater than that in an untreated slice from the same crystal subjected to the same process. It is believed that a metal-silicon liquid phase established on the Si surface getters recombination centers from within the bulk of the material, thereby preserving the lifetime. ***S. J. Silverman and J. B. Singleton.*** *Electrochemical Society, Journal*, v. 105, Oct. 1958, p. 591-594.

782* Additions of Ferro-Silico-Zirconium to Liquid Grey Castings. Metallurgical study, mechanical properties, practical rules of fabrication. (*In French.*) Additions de ferro-silico-zirconium a la fonte grise liquide. ***M. Pierre Détrez.*** *Fonderie*, 1958, Aug., p. 374-384.

783* Heterogeneous Distribution of Oxygen in Castings. (*In French.*) Répartition hétérogène dans la fonte. ***Georges Blanc and Albert Blondel.*** *Fonderie*, no. 152, Sept. 1958, p. 399-411.

784* Study on the Nucleation of Graphite and the Kinetics of Graphitization of White Iron Subjected to a Preliminary Heat Treatment. Effects of time and temperature. (*In French.*) Étude sur la germination du graphite et la cinétique de la graphitisation des fontes blanches prétrempées. ***Pierre Laurent and Michel Ferry.*** *Fonderie*, no. 152, Sept. 1958, p. 421-434.

785 International Foundry Technology. Synopses and extracts from papers presented at the Belgian Congress form a comprehensive survey of present-day problems of foundry technology, and the methods put forward for their solution in various countries. *Foundry Trade Journal*, v. 105, Oct. 2, 1958, p. 405-416.

786 Aluminium/Silicon Alloy. Its Solidification and Structure. Original research at Birmingham University, in addition to extracts from earlier work on "Silumin" metallurgy. Currently held views are commented upon in relation to the new work, and both theory and practical foundry significance are integrated. ***S. Ghosh and V. Kondic.*** *Foundry Trade Journal*, v. 105, Oct. 9, 1958, p. 435-441.

787 Timken Goes to Vacuum Melting. Demand is growing for cleaner, sounder steel, in bearings as well as in airborne weapons. Consumable electrode vacuum arc melting is a good way to fill the need. *Iron Age*, v. 182, no. 17, Oct. 23, 1958, p. 64-65.

788 The Effect of Alloying Elements on Creep Behaviour. One of nine papers on continuous casting presented at the Belgium and Luxembourg meeting. The effects of N, C, Mn, Cr, Mo, V, Ti, and Si as alloying elements are considered in some detail. ***J. Glen.*** *Iron and Steel Institute, Journal*, v. 190, pt. 2, Oct. 1958, p. 114-135.

789 Precision Cast Aluminium Wave Guides. Describes steps in the production of low-cost, close tolerance, complex design wave guide components. *Light Metals*, v. 21, Oct. 1958, p. 313-316.

790 Argo-Vac Vacuum Melting Furnace. A 10- to 20-pound indirect-arc vacuum melting furnace which is suitable for all types of investment casting, including Shaw process and Investment-X, and casting in ingot molds. *Machinery (London)*, v. 93, Sept. 10, 1958, p. 601-604.

791 The "Mercast" Process. Use of Frozen Mercury Pattern. This method of precision investment casting utilizes frozen mercury as the pattern material enabling castings of better quality and greater intricacy to be produced than those from wax or plastic patterns. *Metal Treatment and Drop Forging*, v. 25, Sept. 1958, p. 361-362.

792* Mechanized Moulding Matches Manual Skill. The George Fischer "Buehrer" installation is thought to be the nearest approach to a fully automated malleable iron foundry in Europe. *Metalworking Production*, v. 102, no. 40, Oct. 3, 1958, p. 1727-1732.

793* We Cast the Impossible. Light metal castings with 0.050-in. wall thickness for aircraft applications. ***R. H. Osbrink.*** *Modern Castings*, v. 34, Oct. 1958, p. 22-25.

794* Controlling C, H_2, O, N, in Steel Melting. A discussion of modern melting techniques. ***F. E. Van Voris.*** *Modern Castings*, v. 34, Oct. 1958, p. 28 + 5 pages.

795 Change to Investment-Cast Aluminum. An aluminum investment casting was made to secure pressure tightness, high strength, resistance to corrosion, and to take vibration. ***Jim Heldenbrand and Gordon Ingwersen.*** *Precision Metal Molding*, v. 16, Oct. 1958, p. 35.

796 Investment Castings for Jet Engine Starters. Complex shapes, high stresses, and high temperatures all combine to make these parts a production engineer's headache. Investment castings were the answer. ***Frank W. Fernald.*** *Precision Metal Molding*, v. 16, Oct. 1958, p. 50-51.

797* Compressed Air Piping in Foundries. The most important principles necessary for project, execution and maintenance of compressed air pipings and valid for nearly all foundries are dealt with. Special requirements of foundries have to be solved individually according to local conditions. (*In Czech.*) Rozvody stlačeného vzduchu ve slévárnách. ***A. Drozd and B. Štraus.*** *Slévárenství*, v. 6, no. 9, Sept. 1958, p. 276-280.

798* Coatings for Metallic Moulds for Cast Iron. Adhesion and cohesion coatings properties for metallic molds were examined; they present better properties than the coatings used until now. The durability of new coatings is from 700 to 800 pourings contrary to the original 350 to 450 pourings. (*In Czech.*) Barviva na kovové formy pro odlévání šedé litiny. ***Alois Šustek.*** *Slévárenství*, v. 6, no. 9, Sept. 1958, p. 280-283.

799* Importance of Temperature Changes During Cooling of Castings. According to the shape of casting nonhomogeneous temperature distribution is formed at cooling which influences irregular solidification of casting. This is the cause of internal stresses resulting in tears or cracks, even distortion of casting. Longitudinal cracks (e. g. in rolls or rolled ingots) can appear still in the period when the internal layers are in plastic or even in liquid conditions. Rectangular, square or eliptic cross sections resist longitudinal cracks better than the round ones. (*In Czech.*) Význam tepelných pochodů při výrobě odlitků. ***Frantisek Havlicek.*** *Slévárenství*, v. 6, no. 9, Sept. 1958, p. 283-286.

800* Melting Stainless Steel From Scrap When Using Silico-Manganese. When melting stainless steel, the replacement of metallic Mn by Si-Mn at certain conditions of the melting process does not provoke a rise in C content of metal and gives considerable saving in expenditures and consumption of low-carbon ferrochrome and ferro-silicon. (*In Russian.*) Vyplavka nerzhaveiushcheĭ stali na otkhodakh s ispol'zovaniem silikomargantsa. ***L. I. Teder, V. Ia. Monastyrskiĭ, and V. I. Mesiats.*** *Stal'*, v. 18, no. 9, Sept. 1958, p. 801-802.

801 Casting Uranium-5 w/o Zirconium-1.5 w/o Niobium Alloys Into Zirconium and Zircaloy-2 Containers. Experimental castings were successfully made to explore the proposition that U and high U alloys could be bonded to Zr and Zr alloys by a direct casting method. ***J. W. Frank and R. E. Macherey.*** *U. S. Atomic Energy Commission, ANL-5442*, July 1958, 49 pp. (UF767 Un3.1an Contin.)

802 Theoretical Studies of the Solidification of Uranium Castings. A mathematical model has been developed to calculate the time-temperature relationships in a cylindrical U casting during its solidification. Finite-difference equations are used, and the solution is obtained by use of a digital computer. Studies of the effects of such variables as the superheat, rate of pour, mold preheat, mold size, and others are possible, and their effect on casting soundness can be determined. Initial computed results demonstrate that this approach is feasible, and experiments are proposed to verify the method of analysis. ***Billie L. Fletcher, et al.*** *U. S. Atomic Energy Commission, BMI-1276*, July 11, 1958, 48 pp. (UF767 U3b Contin.)

803* Foundry Methods Switch Eliminates Hot Tears in Large Castings, Cuts Weld Time. Five changes in foundry practice representing techniques practical for any foundry are credited with eliminating hot tears in susceptible large steel castings and reducing welding time from 50 hours to about one hour per casting. ***Hubert Chappie.*** *Western Metalworking*, v. 16, Oct. 1958, p. 62-63.

METALS—HEAT TREATMENT

804 One Man Handles Flexible Heat-Treating Line. Smooth work flow, like that in a mass-production shop, comes about from mechanical handling aids and automatic furnace operation. Work size ranges from small parts to large gears, rollers and shafts. ***F. V. Horak.*** *American Machinist*, v. 102, Oct. 20, 1958, p. 142-143.

805 Temperature Distribution Throughout a Stack of Electrical Sheet Steel During Annealing. The temperature at any one time varies horizontally across the plane of the sheets and vertically up the stack. The temperature distribution in the horizontal plane of sheets 8 ft x 3 ft x 0.014 in. thick has been calculated theoretically and compared with that determined experimentally. ***R. J. Wakelin.*** *British Journal of Applied Physics*, v. 9, Sept. 1958, p. 353-358.

806 Generation and Use of Prepared Atmospheres in the Annealing of Low Carbon Steel Strip. Covers, in detail, the steps necessary to produce an acceptable gas and the effect on strip surface when gases vary beyond certain fixed chemical composition. ***George J. Campbell.*** *Industrial Heating*, v. 25, Sept. 1958, p. 1749 + 7 pages.

807* Effect of Heating and Cooling on the Mechanical Properties of an Alloy Steel. On rapid cooling from a temperature above the critical range, the steel possessed poor mechanical properties (low yield and tensile strengths) at all temperatures down to the commencement of martensite formation at about 300 C (572 F). Below this temperature, there was a sudden increase in yield and tensile strengths, accompanied by a marked decrease in ductility. The relation between these mechanical properties and the incidence of cracking after repeated heating and rapid cooling is briefly discussed. ***A. S. Kenneford and T. Williams.*** *Institution of Mechanical Engineers, Proceedings*, v. 171, no. 30, 1957, p. 823-828.

808* Application and Heat Treatment of Plain and Alloyed Steels. This article first deals with the application and heat treatment of plain carbon steels and then proceeds to consider alloyed steels and how the various alloy additions can be used to develop certain physical properties and give greater flexibility in heat treatment. ***A. G. Gardner.*** *Mechanical World and Engineering Record*, v. 138, Oct. 1958, p. 438-442.

809 Vacuum Heat Treating. A summary of which alloys are being vacuum heat treated, how these alloys are vacuum heat treated, and what happens when this is done. ***Richard L. Hoff.*** *Metal Treating*, v. 9, no. 5, Sept.-Oct. 1958, p. 4 + 6 pages.

810 Automatic Fixtures for Induction Heating. Gives factors to consider in installing automatic fixtures and describes types of fixtures. ***C. A. Tudbury.*** *Metal Treating*, v. 9, no. 5, Sept.-Oct. 1958, p. 8 + 4 pages.

811 Heat Treating "K" Monel Sheet. Minimum Rockwell hardnesses of "C" 24 and "A" 62 are being maintained with unprecedented consistency in "K" Monel by means of a heat treatment which was recently adopted by the Convair Division of General Dynamics Corporation ***Thomas A. Dickinson.*** *Metal Treating*, v. 9, no. 5, Sept.-Oct., 1958, p. 10 + 1 page.

812 The Casting and Heat Treating of Steel Gears. The choice of material and type of heat treatment to be used in the processing of cast steel gears depends largely on the ultimate use of the gear and the allowable cost of the part. ***J. M. Calkins and Victor E. Zang.*** *Metal Treating*, v. 9, no. 5, Sept.-Oct. 1958, p. 12 + 1 page.

813 Liquefied Petroleum Gases and Their Uses in Metallurgy. Summarizes the properties and specifications of commercial butane and propane and details of their handling and metallurgical applications. ***C. F. Port.*** *Metal Treatment and Drop Forging*, v. 25, Sept. 1958, p. 363-368.

814 Gas Carburizing and Case Hardenability. Case hardening is now emerging from a traditional art to a controlled scientific procedure, discusses a lack of knowledge of fundamental steel characteristics which would enable more consistent results. ***T. W. Ruffle.*** *Metal Treatment and Drop Forging*, v. 25, Oct. 1958, p. 397-403.

815 New Thermo-Chemical Techniques. I. Bright Annealing. Annealing of steels and refractory alloys. ***P. Galmiche.*** *Metal Treatment and Drop Forging*, v. 25, Oct. 1958, p. 405-408.

816 Developments in Surface Hardening. Surface treatment of steel parts, carried out either by altering the chemical composition of the surface, or by localized heating and cooling, giving an altered metallurgical structure. ***E. Mitchell.*** *Metal Treatment and Drop Forging*, v. 25, Oct. 1958, p. 425 + 6 pages.

817* The Gazal Procedure and the Desulfurization of Thomas Cast Iron. (*In French.*) Le procédé Gazal et la désulfuration des fontes Thomas. ***Pierre Zehringer.*** *Métaux Corrosion-Industries*, v. 33, July-Aug. 1958, p. 293-304.

818* Hardness and "Sulfinuz". Particular advantages are given by the hardness and by amelioration to the fatigue resistance when they are subjected to "Sulfinuz". (*In French.*) Dureté et sulfinuz. ***Y. de Villemeur.*** *Métaux Corrosion-Industries*, v. 33, July-Aug. 1958, p. 324-334.

819* New Process for the Hot Tinning of Cast Iron. The Tin Research Institute used a variation of the Chalmers method, which was successful. (*In French.*) Nouveau procédé pour l'étamage à chaud de la fonte. ***M. C. J. Thwaites.*** *Métaux Corrosion-Industries*, v. 33, July-Aug. 1958, p. 335-342.

820 Plastics in the Plating Industry. Scope in Metal Finishing. The electroplating shop offers a large scope of possible applications for synthetic corrosion resisting materials. ***D. J. Fishlock.*** *Rubber Journal and International Plastics*, v. 135, no. 11, Sept. 13, 1958, p. 377 + 2 pages.

821 Dew Point Monitoring Pays Off. A switchboard sampling system permitting anyone in heat-treating department to check operations gives better quality carburizing at less cost to a manufacturer of truck axles. ***A. R. Keefe and M. R. Koehn.*** *Steel*, v. 143, Oct. 13, 1958, p. 100-101.

822* New 32 Ft. Mobile Gantry Furnace Treats Large Polaris Missile Parts. *F. M. Arnold.* *Western Metalworking*, v. 16, Oct. 1958, p. 46-47.

See also: **831** (effect of tempering temperature on impact strength of steel).

METALS—MECHANICAL AND PHYSICAL PROPERTIES

823 The Temperature Dependence of the Flow Stress of an Age-Hardened Alloy. Measurements have been made of the critical resolved shear stress of single crystals of an Al-Cu alloy between 77 K and 373 K. The crystals were aged so that they contained only Guinier-Preston zones of the first kind. ***A. Kelly and C. Chiou.*** *Acta Metallurgica*, v. 6, Sept. 1958, p. 565-571.

824 The Influence of Lattice Defects on the Electrical Resistivity of a Gold-Copper Alloy (7 at.% Cu). Defects were introduced in wires of a Au-7 at. % Cu alloy by quenching from 900 or 450 C or by stretching 15% at −195 C. The effect of annealing at temperatures up to 300 C on the electrical resistivity was investigated. For comparison, the same experiments were carried out on pure Au. ***B. M. Korevaar.*** *Acta Metallurgica*, v. 6, Sept. 1958, p. 572-579.

825 Slow Strain-Hardening of Ingot Iron. The observed anomalous effects are discussed. It is shown that the serrated stress-strain curves often observed with this type of material are a consequence of the anomalous velocity dependence of strain-hardening. ***A. W. Sleeswyk.*** *Acta Metallurgica*, v. 6, Sept. 1958, p. 598-603.

826* On the Effect of Certain Factors on the Vibratory Motion of a System Carrying a Free Mass. The system is a simplified model of certain mechanisms of the vibratory type. Collision of steel with steel is distinguished by multiple rebounds. The collision of steel masses with a rubber lining, or with the replacement of the monolithic mass m_2 by a mass of the same magnitude consisting of steel balls, may give rise to collisions without multiple rebounds. The beginning of vibration-impact conditions with a rise in frequency, and the end of it with a fall in frequency, are typified by uneven changes in the amplitude value. The system has the property of prolonging the vibration impact conditions to lower values on the frequency. (*In Ukrainian.*) Pro vpliv faktoriv na kolival'nii rukh sistemi. shcho nese vil'nu masu. ***P. I. Galaka.*** *Akademiia Nauk Ukrains' koi RSR, Dopovidi*, 1958, no. 8, p. 817-820.

827* Magnetic Susceptibility of Solid Solutions of Some Metal-Like Compounds. NbC-ZrC, TaC-NbC, TaB_2-ZnB_2, and TiC-TiN by the relative method, taking the susceptibility of one of the components as unity. An attempt is made to explain the dependence of the magnetic susceptibility on the concentration in these alloys. (*In Ukrainian.*) Magnitna spriiniatlivist' tverdikh rozchiniv deiakikh metalopodibnikh spoluk. ***G. V. Samsonov, V. S. Neshpor, and N. S. Strelnikova.*** *Akademiia Nauk Ukrains'koi RSR, Dopovidi*, 1958, no. 8, p. 838-840.

828 A Guide for Computing Transverse Rupture Strength. Explanation of the theory and operation of a Nomogram to simplify quality determination and control of tungsten carbide materials. ***Carl W. Peters.*** *Carbide Engineering*, v. 10, Oct. 1958, p. 11-13.

829 Analysis of the Plastic Bending of Wide Plates, and the Effect of Stretching on Transverse Residual Stresses. *J. M. Alexander.* *Chartered Mechanical Engineer*, v. 5, no. 8, Oct. 1958, p. 357-360.

830 Self Restraint in Steel in Relation to Brittle Fracture. *S. A. Main.* *Iron & Steel*, v. 31, no. 11, Oct. 1958, p. 479 + 6 pages.

831* Dependence of the Impact Strength of Steel on Tempering Temperature. Design of the testing machine and shape of test specimens. Tempering temperature curves for hardened 30 x GS steel. (*In Russian.*) Zavisimost' udarnoĭ vynoslivosti stali ot temperatury otpuska. ***S. S. Ermakov.*** *Izvestiia Vysshikh Uchebnykh Zavedenii, Chernaia Metallurgiia*, 1958, no. 7, July, p. 157-162.

832 High-Purity Cobalt — Its Properties. A research-in-progress report. Control of purity and process were found to be extremely important for accurate results. ***F. R. Morral.*** *Journal of Metals*, v. 10, Oct. 1958, p. 662-664.

833 Consider Cr-Mo-V Low Alloy Steels for 1000F Service. High temperature properties. ***C. M. Cosman.*** *Materials in Design Engineering*, v. 48, Oct. 1958, p. 93-96.

834 Alloy Ductile Irons Promise Better High Temperature Strength. *R. D. Schelleng and J. T. Eash.* *Materials in Design Engineering*, v. 48, Oct. 1958, p. 97.

835 Aluminum Sand Castings. Gives graphs to show resistance of castings to repeated impact and fatigue at high temperatures. ***W. J. Reichenecker and D. K. Fox.*** *Materials in Design Engineering*, v. 48, Oct. 1958, p. 103-105.

836 Pure Torsion Creep Tests on Magnesium Alloy (2% Al) at 20°C, and on 0.2% C Steel at 450° C, at Low Rates of Strain (10^{-6} to 10^{-9} per Hour). Creep strain for each of the materials shows a dependence on time which does not alter throughout the range of creep rates concerned. The stress dependence, in addition to terms of more than unit power, noted at normally investigated levels of creep rate, also includes a term of unit power stress dependence. This represents a recoverable element of creep, which becomes increasingly dominant at the lower rates. ***A. E. Johnson, J. Henderson, and V. D. Mathur.*** *Metallurgia*, v. 58, Sept. 1958, p. 109-117.

837 Deformation Mechanisms in Magnesium and Some Magnesium-Aluminum Alloys. A literature survey was made as part of a general program covering the properties of potential alloys for canning nuclear fuels in gas-cooled reactors. This paper discusses the modes of deformation of Mg and Mg-Al alloys and considers the formation of intergranular holes. ***R. D. Stacey.*** *Metallurgia*, v. 58, Sept. 1958, p. 125-128.

838* Study of Some Physical Properties of Gallium Monocrystals Near the Fusion Point. IV. The Variation of Electrical Resistance With Temperature. Measurements of electrical resistivity were taken up to 29.75 C. (*In French.*) Étude de quelques propriétés physiques des monocristaux de gallium près du point de fusion. IV. La variation de la résistance électrique avec la température. ***Marc Erny.*** *Métaux Corrosion-Industries*, v. 33, July-Aug. 1958, p. 305-323.

839* High Temperature Mechanical Properties of the New Magnesium Alloys. Recent development of new alloys, particularly the Mg-Th systems, has given Mg a new lease on life in the aircraft-missiles field. Properties are detailed. ***R. E. Bockrath.*** *Modern Metals*, v. 14, no. 8, Sept. 1958, p. 52 + 3 pages.

840 Fatigue of Structural Materials at High Temperature. Importance of fatigue as cause of service failure; fatigue life, statistical aspects, progressive fracture, and physical concepts; fatigue strength at high temperatures; dynamic creep under cyclic stress; resonance fatigue and its relation to material damping. ***B. J. Lazan.*** *North Atlantic Treaty Organization, AGARD Report No.* 156, Nov. 1957, 27 pp. (TL565 Ag11r Vis.)

841 Volume Changes Associated With the Superconducting Transition. Measurements were made of the length change associated with the superconducting transition of Pb, Sn, Tl, In, and Ta. An attempt is made to relate the magnitude and anisotropy of the effect to current theories of the superconducting state. ***G. D. Cody.*** *Physical Review*, v. 111, ser. 2, no. 4, Aug. 15, 1958, p. 1078-1086.

842 Elastic Constants of Zinc From 4.2°K to 77.6°K. The adiabatic elastic constants of zinc single crystals were measured by an ultrasonic pulse technique. The values extrapolated to 0°K are: $c_{11} = 1.770$, $c_{33} = 0.685$, $c_{44} = 0.459$, $c_{12} = 0.348$, $c_{13} = 0.528$ in units of 10^{12} dynes/cm^2. A Debye characteristic temperature, θ, of 327 ± 5°K was calculated at 0°K by averaging the inverse cube of the longitudinal and transverse elastic wave velocities over all directions of propagation. ***C. W. Garland and Richard Dalven.*** *Physical Review*, v. 111, ser. 2, no. 5, Sept. 1, 1958, p. 1232-1234.

843* Theory of the Changes in Metals During Fatigue. Variation of the Spatial Distribution of the Stability of the Obstacles to Plastic Slip. It is supposed that the fracture of metals is the outcome of a process dividing the internal reactions to the external forces among smaller and smaller domains which become less and less numerous during the application of mechanical efforts. This effort, slowly or rapidly applied, and either permanent or cyclical, causes increasing differentiation between the plastic rigidity and the spatial distribution of the stability of the metastable atomic or molecular configurations, returning certain domains to the original condition or to a new condition and increasing the disorder of others. (*In French.*) Théorie de l'évolution des métaux pendant la fatigue. Variation de la répartition spatiale de la stabilité des obstacles au glissement plastique. ***W. Barrois.*** *Revue de Métallurgie*, v. 55, Aug. 1958, p. 761-777.

844 An Investigation of Hot Ductility of Inconel and Inconel X. To find the cause for the change in properties due to the thermal cycles encountered in arc welding through a metallographic study of the fractured specimens. ***Edward A. Pigan.*** *U. S. Atomic Energy Commission, ORNL-2571*, Sept. 19, 1958, 55 pp. (UF767 U3o Contin.)

845 A Variational Theorem for Creep With Applications to Plates and Columns. Solutions to problems of the creep behavior of plates, columns, beams, and shells can be obtained by means of the direct methods of the calculus of variations in conjunction with the stated theorem. The application of the theorem is illustrated for plates and columns by the solution of two sample problems. ***J. Lyell Sanders, Jr., Harvey G. McComb, Jr., and Floyd R. Schlechte.*** *U. S. National Advisory Committee for Aeronautics, Report* 1342, 1958, 7 pp. (TL521 Un3r Vis.)

846 The Rate of Fatigue-Crack Propagation in Two Aluminum Alloys. In order to provide a check on the theoretical predictions and to evaluate certain empirical constants appearing in the expression for the rate of fatigue-crack propagation, an extensive series of tests has been conducted. ***Arthur J. McEvily, Jr. and Walter Illg.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4394, Sept. 1958, 46 pp. (TL570 Un3t Vis.)

847 Galvanomagnetic Properties of Lead Sulfide, Lead Selenide, and Lead Telluride Between 4.2°K and Room Temperature. Hall and resistivity measurements revealed essentially constant carrier concentrations of about 10^{18} per cm^3 between 4.2 and 300 K, and Hall mobilities varying as $T^{-2.3}$ between 50 and 300 K. ***Robert Stephen Allgaier.*** *U. S. Department of the Navy, Bureau of Ordnance, NAVORD Report* 6037, June 19, 1958, 195 pp. (TL570 Un3.55n Contin.)

848* Methods of Thermal Fatigue Test. Review of existing methods for determination of the resistance to thermal fatigue. (*In Russian.*) K voprosu o metodike provedeniia ispytanii na termicheskuiu ustalost'. ***S. V. Serensen and P. I. Kotov.*** *Zavodskaia Laboratoriia*, v. 24, no. 9, 1958, p. 1097-1106.

See also: **807** (effect of heating & cooling in alloy steel); **1185** (strength of brazed joints).

METALS—MECHANICAL WORKING

849 On the Economics of the Basic Turning Operation. Determines relationships between tool wear, costs, and output. ***R. C. Brewer.*** *ASME, Transactions*, v. 80, no. 7, Oct. 1958, p. 1479-1489.

850* Types and Properties of Cutting Fluids. I. The selection of cutting or grinding fluid is influenced by considerations of cost, necessary function, excellence of results required, and facilities to utilize the fluid. ***E. L. H. Bastion.*** *Canadian Metalworking*, v. 21, Oct. 1958, p. 16 + 5 pages.

851 Rough Grinding With Silicon Carbide Wheels. Rough grinding carbide tools is actually a precision operation. Here are the answers to nine frequently asked questions. ***Richard A. Parke.*** *Carbide Engineering*, v. 10, Oct. 1958, p. 16-19.

852* Techniques for Fabricating Magnesium. Rapid oxidation, pre-weld cleaning, heating before forming, danger of fire are problems considered. *Industry & Welding*, v. 31, Oct. 1958, p. 64 + 2 pages.

853 Producing Large Thin-Gauge Sheets by the "Sandwich-Rolling" Technique. A technique for the production of stainless-steel and alloy-steel sheets. *Machinery (London)*, v. 93, Sept. 17, 1958, p. 648.

854* Precision Metal Routing. Very high speed machining so reduces labor cost as to overcome the effect of removing a great bulk of metal. Current development includes work on Ti

for aircraft and nuclear power plants. *Mechanical World and Engineering Record*, v. 138, Oct. 1958, p. 452-454.

855 Glass Lubricants in Metallurgy. Reviews some of the applications of glass lubrication and the techniques involved in the processes. ***L. K. Kovalev and V. A. Ryabov.*** *Metal Industry*, v. 93, Sept. 26, 1958, p. 249-251. (Translated from *Steklo i Keramika* by Kenneth Shaw.)

856* Can the Ceramic Tool Replace Hard Alloy? A review of development, manufacture, and properties of ceramic tools. Hardness, bending strength, and cutting speed relationship of various cutting tool materials. (*In German.*) Kann die Schneidkeramik das Hartmetall ersetzen? ***F. Kölbl.*** *Planseeberichte für Pulvermetallurgie*, v. 6, no. 2, Aug. 1958, p. 48-66.

857* Trends in Gear Cutting and Finishing Processes. After discussing earlier developments in gearcutting, the author turned to methods that have been adopted to increase the rate of production. ***A. Sykes.*** *Metalworking Production*, v. 102, no. 39, Sept. 26, 1958, p. 1692-1694.

858* Production Technology of Steam Turbine Blades by Rolling and Drawing Methods. Method of rolling and drawing of steam turbine blades and section grips. After the rolling operations the material was subjected to immediate annealing. To avoid surface failures and metal losses, rolled and annealed rods were etched in alkali bath. Operations were made with roll dies fastened to a special grip of the drawing bench. (*In Polish.*) Technologia produkcji łopatek turbin parowych droga walcowania i przeciagania. ***J. Nowotarski and R. Wusatowski.*** *Prace Instytutow Hutniczych*, 1958, no. 4, p. 199-207.

859 Designing for Extrusions. The chemistry, physical properties, and mechanical properties of the different extrudable alloys and the properties as extruded will be presented in a series of tables. The first three dealing with Al are presented here. *Precision Metal Molding*, v. 16, Oct. 1958, p. 44-47.

860 Development of Cermet Fuel Elements. Fabrication techniques for making metal-ceramic fuel elements containing 60 to 90 volume % of UN or UO_2 in a Type 302B stainless steel matrix was investigated. Specimens produced by this method were evaluated on the basis of their microstructure, modulus of rupture, electrical conductivity, and resistance to thermal shock. ***Stan J. Paprocki, Donald L. Keller, George W. Cunningham, and Donald E. Kizer.*** *U. S. Atomic Energy Commission, BMI-1282*, Aug. 11, 1958, 18 pp. (UF767 U3b Contin.)

861 The Cold Working of Extruded Zircaloy Tubing. This report is primarily concerned with the high quality, small diameter tubing that is presently required for fuel elements. The problems associated with working Zr alloys are made even more severe by the chemical and dimensional specifications for the final product. Previous development work in this field has mainly centered around a search for satisfactory lubricants for hot and cold working these reactive alloys. A brief summary of the various lubricants which have been investigated is given. ***N. R. Gardner and P. Loewenstein.*** *U. S. Atomic Energy Commission, NMI-1194*, Apr. 30, 1958, 55 pp. (UF767 Un3.1nm Contin.)

862 Automatic Line Tracing in Oxygen Shape-Cutting Machines. Electronic system developed for following the lines of ordinary pattern drawings, rather than black-white edges on specially prepared edge patterns or templets. ***A. F. Chouinard and E. L. McDonald.*** *Welding Journal*, v. 37, Oct. 1958, p. 988-990.

863* The Manufacture of Welded Wire Mesh and Some of Its Uses. A short history followed by production details and applications. ***Charles A. Kuhl.*** *Wire and Wire Products*, v. 33, Oct. 1958, p. 1167 + 4 pages.

864* Action of Lubricants in Pressure Working of Metal. Investigation of the effect of lubricants (sodium oleate of various concentrations) on the wire and strip metal drawing process. (*In Russian.*) Deĭstvie smazok pri obrabotke metallov davleniem. ***S. Ia. Veĭler and V. I. Likhtman.*** *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 9, Sept. 1958, p. 2025-2034.

See also: **696** (friction and lubrication of alides in machine tools); **776** (surface finish); **1117** (metal-fiber-reinforced epoxy dies); **1119** (machining glass base laminated plastic).

METALS—METALLOGRAPHY, TRANSFORMATIONS, AND STRUCTURES

865* The Process of Controlling Graphite Growth in Cast Iron. The growth of graphite in cast iron is connected with the diffusion of C and evacuation of the matrix atoms from the graphitization front. The effect of preliminary deformation on the rate of C diffusion was compared with that of the growth of graphite. Deformation leads to acceleration of graphite growth with subsequent graphitization. An investigation of the effect of preliminary deformation on the rate of cast iron decarburization in H was carried out, and led to the conclusion that the rate of C diffusion decreases after deformation. Thus C diffusion does not control the growth of graphite. (*In Ukrainian.*) Pro protses, shcho kontroliue shvidkist' zrostannia grafitu v chavunakh. ***K. P. Bunin and A. V. Chernovol.*** *Akademiia Nauk Ukrains'koi RSR, Dopovidi*, 1958, no. 8, p. 831-834.

866 Observations of Dislocations in Iron Whiskers. Dislocations introduced by plastic deformation of the whisker have been investigated and arrays of dislocations produced by annealing the deformed whiskers have been studied. ***R. V. Coleman.*** *Journal of Applied Physics*, v. 29, Oct. 1958, p. 1487-1492.

867* New Crystalline Phase of Thin Film of Iron-Nickel Alloys. Discovered with electronic microscope at 650 C. Has rhombic structure $a_1 = 3.42$; $b_1 = 5.9$ and $c_1 = 5.06$ kX. (*In Russian.*) Novaia kristallicheskaia faza v tonkikh plenkakh splavov Fe-Ni. ***B. Ia. Pines and I. P. Grebennik.*** *Kristallografiia*, v. 3, no. 4, 1958, p. 461-466.

868* Certain Regularities in the Structure of Ternary Metal Compounds. Relation between structure and composition. Applicability of the law for binary systems to ternary systems. Exceptions are listed. (*In Russian.*) O nekotorykh zakonomernostiakh v strukturakh troĭnykh metallicheskikh soedineniĭ. ***L. S. Palatnik and V. A. Finkel'.*** *Kristallografiia*, v. 3, no. 4, 1958, p. 467-472.

869* Cast Iron Containing Diffused Graphite After Annealing. Physiochemical and Metallographical Aspects. Formation and evolution of transition carbides from martensite or bainite. Epitaxic seeding of graphite from hexagonal carbide. Graphite growth from the morphological and kinetic viewpoints. Treatments and mechanical properties of cast iron containing diffused graphite. (*In French.*) Fonte a graphite diffus de recuit. Aspects physicochimiques et métallographiques. ***J. Pomey.*** *Revue Universelle des Mines*, v. 101, ser. 9, no. 14, Sept. 1958, p. 293-300.

870 The Structure of Steel. Nontechnical explanation of the metallurgical structure of the various steels and steel alloys. Shows how the properties of any given steel will depend on both its composition and its treatment during manufacture. The basic chemistry of Fe and steel is outlined, with references to the effects of cooling from the liquid state, and atomic and crystalline structure. Impurities found in steels and their effects are explained, as well as the effects of the various processes of mechanical working. The wide range of modern alloy steels is reviewed, and particular attention given to stainless steels and heat-resisting steels. ***Edwin Gregory and Eric N. Simons.*** 176 pp. 1958. Philosophical Library, 15 E. 40th St., New York 16, N. Y. (TN693.17 Si57s3)

871 Typical Microstructures of Cast Metals. Microstructure of cast iron, steel, and non-ferrous alloys. In most cases chemical composition and mechanical properties are also given. ***G. Lambert, editor.*** 224 pp. 1957. The Institute of British Foundrymen, Manchester, England.

872 Metallographic Studies of Uranium. Three different metallographic approaches, conventional metallography, pre-characterized surface metallography, and fractography, have been used to study the nature and extent of reactor induced microstructural changes in uranium. ***T. K. Bierlein and B.***

Mastel. *U. S. Atomic Energy Commission, HW-56412,* 24 pp. (UF767 Un3.1hw Contin.)

873 The Solubility of Iron-Nickel Alloys in Liquid Lead at 700 to 1100°C. Reports results of a study on equilibrium solubilities of Fe-Ni alloys in liquid Pb at 700 - 1100 C. Primary emphasis was placed on the thermodynamics of the problem and only qualitative data were obtained on the kinetic aspects. ***B. Fleischer and J. F. Elliott.*** *U. S. Atomic Energy Commission, NYO-4684,* 22 pp. (UF767 U3ny Contin.)

874 The Self-Diffusion of Niobium. II. Measurements made at 2000 C and 1800 C yield values of 3.2×10^{-9} cm²/sec and 1.7×10^{-10} cm²/sec respectively. ***R. Resnick, L. S. Castleman, and L. Seigle.*** *U. S. Atomic Energy Commission, SEP-248,* June 30, 1958, 12 pp. (UF767 Un3.1se Contin.)

875* Contemporary Theories of Cathode Scattering and the Microrelief of the Damaged Metal Surface. Review of works dealing with important facts for building up theory of cathode scattering. (*In Russian.*) Sovremennye teorii katodnogo raspyleniia i mikrorel'ef razrushaemoĭ poverkhnosti metalla. ***V. E. Iurasova.*** *Zhurnal Tekhnicheskoĭ Fiziki,* v. 28, no. 9, Sept. 1958, p. 1966-1970.

METALS—POWDER

876 Strip From Metal Powder Developed by E. W. Bliss. Commercial production of high quality Cu strip from metal powder using the chemical process. ***Charles A. Weinert.*** *Automotive Industries,* v. 119, no. 7, Oct. 1, 1958, p. 70 + 1 page.

877 Electrodeposition of Metal Powders. After outlining the principles underlying normal electroplating for smooth deposits, the author discusses the conditions required for powder formation. Finally, production techniques are provided. ***Gunnar Gabrielson.*** *Industrial Chemist,* v. 34, Oct. 1958, p. 529-532.

878 Slip Casting Cermets. The slip casting process and a comparison of the casting-sintering technique with the two other main methods of manipulating cermets and similar materials—powder metallurgical processes and extrusion. *Metal Industry,* v. 93, Sept. 26, 1958, p. 252.

879* Sintering Beryllium Powder Without Application of Pressure. Development and application of a technology permitting compacting loose Be powder without pressure. Advantages over other processes employing vacuum hot presses. Technique may be suitable for manufacture of reactor elements. The compact can be machine shaped. (*In German.*) Das Sintern von Berylliumpulver ohne Druckanwendung. ***T. R. Barrett, G. C. Ellis, and R. A. Knight.*** *Planseeberichte für Pulvermetallurgie,* v. 6, no. 2, Aug. 1958, p. 39-47.

880 Design Properties of Sinterings I. Non-Ferrous Alloys. *Precision Metal Molding,* v. 16, Oct. 1958, p. 54-56.

881 Slip Casting. Its Field Broadens. Slip casting is widening its field of usefulness. It has now evolved into a way to cast parts from powdered metals. ***L. M. Schifferli, Jr.*** *Product Engineering,* v. 29, no. 42, Oct. 13, 1958, p. 84-85.

882 Vacuum Reactions of Niobium During Sintering. Purification of powder-metallurgy Nb bars by removal of O, N, and C during vacuum sintering at 2000 and 2150 C was investigated. Mixtures of Nb_2O_5 and NbC were analyzed after sintering at 1500 to 2150 C. The thermal stabilities of commercial purity Nb_2O_5, NbN, and NbC were investigated by heating in vacuum up to 2150 C. The mechanisms for removal of O, N, and C during high temperature vacuum sintering are discussed. ***William D. Klopp, Chester T. Sims, and Robert I. Jaffee.*** Paper from "Technology of Columbium (Niobium)", p. 106-120, 1958 John Wiley & Sons, New York. (TN799.N7 EL25t Over.)

See also: **856** (ceramic tools and hard alloys).

NONDESTRUCTIVE TESTING AND QUALITY CONTROL

883 A Preliminary Study of Remote Fluoroscopy in the 2-Mev Range. In spite of the usual low screen efficiency, penetrameter sensitivities of approximately 2% for aluminum and 3% for steel were obtained in some ranges. ***A. F. Wegener and E. A. Burrill.*** *ASTM Bulletin,* 1958, no. 232, Sept., p. 48-51.

884 Cam-Inspection Equipment. The first analysis of the kinds of cam-inspection devices made in this country or imported. ***Harold A. Rothbart.*** *American Machinist,* v. 102, Oct. 6, 1958, p. 97-100.

885 Seeing-Eye Tool Inspects Long Bores. A modified borescope method permits a 360° Zyglo penetrant inspection of a 5½ in. x 25 ft. tube. ***Robert Weglin and Fred R. Miller.*** *American Machinist,* v. 102, Oct. 6, 1958, p. 101.

886* Spectrographic Bath Control in Steel Strip Zinc Coating by Continuous Sendzimir Process. A description of the tests run to work out a spectrographic method suitable to control the galvanizing bath installed at "Cornigliano" S.p.A. The method uses an A.R.L. "Multisource" arc-like discharge between a flat zinc specimen, cast into a mold, and a graphite counterelectrode. Aluminum is determined in a concentration field ranging from 0.01 to 0.30% as well as lead between 0.05 and 0.60%. (*In Italian.*) Il controllo spettrografico del bagno nella zincatura di nastri d'acciaio con il processo Sendzimir. ***A. Porta.*** *Metallurgia Italiana,* v. 50, no. 8, Aug. 1958, p. 325-328.

887* An Evaluation of the Effectiveness of Penetrants. Defects resulting from forming operations will almost always extend to the surface of the part. Penetrant inspection is a valuable tool for detecting surface defects. Comparison of various types of commercial penetrants. ***R. E. Kleint.*** *Nondestructive Testing,* v. 16, no. 5, Sept.-Oct. 1958, p. 421-429.

888* New Developments in the Field of Radiography and the Intensification of Radiographs. Physical and physiological principles; screen examination(fluoroscopy) compared with X-ray photography and Xero-radiography; intensification. (*In German.*) Neuere Entwicklungen auf den Gebieten der Radiographie und der Röntgenbildverstärkung. ***Heinrich Nassenstein.*** *Schweissen und Schneiden,* v. 10, Sept. 1958, p. 376-379.

889* Methods Recommended in the Radiographic Examination of Seams Obtained by Fusion Welding on Steel Plates Less Than 50 mm in Thickness. Protection against X-rays and gamma rays. Surface preparation; localizing the welds on radiograms, length of films. Techniques in making the films. Protection against secondary radiation, distance to the source. Image quality indicators. (*In French.*) Pratiques recommandées pour l'examen radiographique des joints soudés par fusion sur tôles d'acier d'epaisseurs inférieures à 50 mm. *Soudage et Techniques Connexes,* v. 12, nos. 7/8, July-Aug. 1958, p. 291-294.

890* X-Ray Unit Speeds Airframe Inspection. Radiographic techniques simplify plane check and fast film cuts exposures 75%. Unit mounted on boom 45 ft. in air. *Western Metalworking,* v. 16, Oct. 1958, p. 59-60.

891* "You Can't Inspect Quality Into a Product—It Must Be Built In." III. Central quality checker, precise gages, operators who use "defect chalk", and departmental inspection are among reasons for peak quality at one factory. ***Edward L. Clark.*** *Wood and Wood Products,* v. 63, Oct. 1958, p. 30 + 2 pages.

NUCLEAR PHYSICS, NUCLEONICS, AND RADIATION

892 Nuclear Radiation Effects on Materials. A review of basic principles and summary of current knowledge. ***Gerald Reinsmith.*** *ASTM Bulletin,* 1958, no. 232, Sept., p. 37-47.

893* A Contribution to the Theory of the Dirac Particles With Oriented Spin. A study proving that phenomena connected with the nonconservation of parity in case of low reciprocal effect, can be investigated by means of Dirac equations with due allowance for the spin orientation. (*In German.*) Zur Theorie der Dirac-Teilchen mit orientiertem Spin. ***A. Sokolow and B. Kerimow.*** *Annalen der Physik*, v. 2, nos. 1-2, Aug. 1958, p. 46-53.

894 Effective Cross Section Values for Well-Moderated Thermal Reactor Spectra. Tabular data are presented for 27 elements and isotopes. ***C. H. Westcott.*** *Atomic Energy of Canada, Limited, AECL No.* 670, Aug. 1958, 27 pp. (QC770 At71a Contin.)

895* Investigation on Stand of Experimental Nuclear Reactor VVR-S. A study of the neutron-physical parameters of the reactor: critical mass, maximal and operating loading, compensating capacity of control rods and shielding, effects on reaction of different factors, distribution of the neutron density according to the height and radius of the active zone. (*In Russian.*) Issledovanie na stende eksperimental'nogo iadernogo reaktora BBP-C. ***N. A. Lazukov, I. E. Chelnokov, and V. P. Ivanov.*** *Atomnaia Energiia*, v. 5, no. 1, July 1958, p. 44-51 + 1 plate.

896* Some Methods of Mass Preparation of Po-α-Be-Neutron Sources. A detailed description of a wet method to prepare Po-α-Be sources. Preparation of equal mixtures of polonium and beryllium by passing the polonium nitrate solution through a beryllium powder with subsequent desiccating and pulverization of the product obtained. (*In Russian.*) O nekotorykh metodakh massobogo izgotovleniia Po-α-Be-neitronnykh istochnikov. ***G. S. Komaishko, et al.*** *Atomnaia Energiia*, v. 5, no. 1, July 1958, p. 64-67.

897* About Some Works on Controlled Thermonuclear Reactions of the Institute for Atomic Power of the Academy of Science of the U.S.S.R. (*In Russian.*) O nekotorykh rabotakh Instituta Atomnoĭ Energii Akademii Nauk SSSR po upravliaemym termoiadernym reaktsiiam. ***I. V. Kurchatov.*** *Atomnaia Energiia*, v. 5, no. 2, Aug. 1958, p. 105-110 + 2 plates.

898* Effect of the Temperature of Neutron Gas on the Campaign Time and Reproduction of Fuel in a Power Reactor. Calculation results of investigation of the effect of neutron gas temperature on cycle time of a reactor, reproduction of Pu^{239} and amount of generated electrical energy. Two variants of the cores of uranium-graphite reactor with sodium heat-transfer agent. Most efficient temperature of neutron gas for such reactors is established as 900 to 1000 K. (*In Russian.*) Vliianie temperatury neĭtronnogo gaza na prodolzhitel'nost' kampanii i vosproizvodstvo goriuchego v energeticheskom reaktore. ***A. K. Krasin, M. E. Minashin, and V. Ia. Sviridenko.*** *Atomnaia Energiia*, v. 5, no. 2, Aug. 1958, p. 111-118.

899* Distribution of Fragments According to Masses by Fission With 14.6 Mev. U^{235}, U^{238} and Pu^{239} Neutrons. Method and results of measuring relative yields of some fragments formed during the above fission. Plotting of distribution curves by experimental and "reflected" points. Consideration of some special features of these distributions. (*In Russian.*) Raspredelenie oskolkov po massam pri delenii U^{235}, U^{238} i Pu^{239} neĭtronami s energieĭ 14.6 Mev. ***A. N. Protopopov, et al.*** *Atomnaia Energiia*, v. 5, no. 2, Aug. 1958, p. 130-134.

900* Obtaining Weighable Quantities of Tc^{99} From Neutron-Irradiated Molybdenum. Various methods of separation of technetium from molybdic anhydride irradiated with thermal neutrons in a nuclear reactor. Identification of the separated technetium by means of spectral analysis, and by measuring absolute activity and maximum energy of its β-radiation. Study of some chemical properties of technetium. (*In Russian.*) O poluchenii vesomykh kolichestv Tc^{99} iz obluchennogo neĭtronami molibdena. ***V. I. Spitsyn and A. F. Kuzina.*** *Atomnaia Energiia*, v. 5, no. 2, Aug. 1958, p. 141-146.

901 Measurements of Absolute Pair Production Cross Sections at Low Energies. Using an improved analysis in conjunction with a relative method for the measurement of absolute pair production cross sections, the pair production cross sections per atom of lead have been measured for the γ rays emitted by Co^{60} and Sb^{124}. The Z dependence of this cross section was measured for the Co^{60} radiation using targets of Al, Fe, Cu, Mo, Ag, Sn, and Pb. Results are in agreement with other experimental determinations. They are represented graphically. ***S. Standil and V. Shkolnik.*** *Canadian Journal of Physics*, v. 36, Sept. 1958, p. 1154-1160.

902 The Theory of Forbidden β-Decay. The angular distributions of electrons and of neutrinos and the polarization of the electrons emitted by an oriented source in β-decay of arbitrary forbiddenness are calculated in terms of various angular-momentum coupling constants and of certain generalizations of the well-known combinations of electron radial wave-functions, L_r, M_r, N_r. ***G. E. Lee-Whiting.*** *Canadian Journal of Physics*, v. 36, Sept. 1958, p. 1199-1244.

903* Isotope Production in Nuclear Reactors. Reactors as intensive source of neutrons in all ranges of energy between a few MeV to a few hundredths eV. These are thermal neutrons used in producing radioactive isotopes. Activation of an element, production of a radiochemically pure and inactive material. (*In German.*) Die Isotopenproduktion in Kernreaktoren. ***P. Tempus.*** *Chimia*, v. 12, Sept. 1958, p. 273-275.

904 In Nuclear Power Plant Design, How Safe Is Safe Enough? American practice has been to design for the ultimate in safety as contrasted with philosophy in cost-conscious Europe. ***Ira G. Stubbart.*** *Consulting Engineer*, v. 11, Oct. 1958, p. 94-97.

905* Some Aspects of the Spherical Harmonics Method for Neutron-Transport Problems in Cylindrical Geometry. A solution is first given of the Boltzmann differential equation for the transport of monoenergetic neutrons in a complete cylindrically symmetrical medium, which scatters neutrons isotropically, according to the method of spherical harmonics. The constants of integration, on the other hand, are then expressed by means of the terms of the spherical harmonics moments. ***Ladislav Trlifaj.*** *Czechoslovak Journal of Physics*, v. 8, no. 4, 1958, p. 390-395.

906* Energy Spectrum of α Particles Emitted From Sources of Different Thicknesses. The energy distribution $N(E)dE$ found can be expressed by a semi-empirical formula, which on the whole agrees with experiment. The source of α particles was uranium oxide U_3O_8. The energy distribution was measured with AGFA K2 nuclear emulsions 200 μ thick. Altogether 3,602 trajectories of α particles in the nuclear emulsions of five plates were measured. ***Ivo Chudáček.*** *Czechoslovak Journal of Physics*, v. 8, no. 4, 1958, p. 396-403.

907 Elementary Nuclear Physics. Written for those who are not physicists but are engaged in this activity and covers the basic physics of reactor design in an elementary manner. It should also serve as a useful introduction to radioactivity for those involved with the applications of radio-isotopes. A simple account of the nucleus, its structure, energetics and reactions. ***W. K. Mansfield.*** 60 pp. 1958. Temple Press, London. (QC778 M31e)

908 Design Considerations in a Nuclear Safety Instrumentation System. The proposed system for the Enrico Fermi Atomic Power Plant is described. ***V. S. Underkoffler and R. G. Olson.*** *Electrical Engineering*, v. 77, Nov. 1958, p. 1008-1013.

909* Controlled Thermonuclear Research in the United Kingdom. Reviews history, the basic processes, instability problems, and future trends. *Engineer*, v. 206, Oct. 10, 1958, p. 572-574.

910 British Reactor of the Future. Britain's major nuclear effort is concentrated on reactors with gas cooling. Possibilities of achieving high temperatures have been studied. *Engineering*, v. 186, Sept. 12, 1958, p. 336-339.

911 Peaceful Uses of Atomic Energy. Summary of the Geneva Conference. ***John Cockcroft.*** *Engineering*, v. 186, Sept. 19, 1958, p. 372-375.

912 Fissile and Fertile. Fuels for nuclear reactors—resources of fissile and fertile materials—using plutonium and thorium—economics of recycling and blending—fuel processing and refining. *Engineering*, v. 186, Oct. 10, 1958, p. 464-465.

913 Reactor G-1. Description of the First French Graphite Reactor and of the Experiments Performed in 1956. The main results are given together with some comments. (*In French.*) Réacteur G-1. Présentation du premier réacteur a graphite français et des expériences effectuées en 1956. ***J. Bussac, C. Leduc, and C. P. Zaleski.*** *France, Commissariat a l'Énergie Atomique, Rapport CEA No.* 670(A), 1957, 40 pp. (QC770 F84.2r Contin.)

914 Diffusion of Graphite—The Effect of Cylindrical Canals. Experiments on thermal neutron diffusion in the graphite used as moderator in the pile G 1 have been carried out and the objectives stated. (*In French.*) Longueur de diffusion du graphite - Effet des canaux cylindriques. ***R. Carle ,et al.*** *France, Commissariat a l'Énergie Atomique, Rapport CEA No.* 670 (B), 1957, 20 pp. (QC770 F84.2r Contin.)

915 A Study of Uranium-Thorium Mixed Lattices. From the measurements at constant charge and at constant concentration, it is possible by extrapolation to determine the critical charges and concentrations. (*In French.*) Étude de réseaux mixtes - uranium - thorium. ***P. Bacher, R. Eckert, and R. de Mazancourt.*** *France, Commissariat a l'Énergie Atomique, Rapport CEA No.* 670(D), 1957, 12 pp. (QC770 F84.2r Contin.)

916 Reactor G-1. Measurements of Reactivity in G-1. Methods used during the physical study of the reactor G-1 to determine the variations of the effective multiplication factor consecutive to a given change in the geometry of the multiplying medium. (*In French.*) Réacteur G-1. Mesures de réactivité sur G-1. ***J. Bernot, J. C. Koechlin, L. Portes, and A. Teste du Bailler.*** *France, Commissariat a l'Énergie Atomique, Rapport CEA No.* 670 (F), 1957, 18 pp. (QC770 F84.2r Contin.)

917 Reactor G-1. Measurement of the Temperature of the Neutrons in Reactor G 1. (*In French.*) Réacteur G-1. Mesure de la température des neutrons dans la pile G 1. ***V. Raierski and B. Sautiez.*** *France, Commissariat a l'Énergie Atomique, Rapport CEA No.* 670 (K), 1957, 4 pp. (QC770 F84.2r Contin.)

918 Reactor G-1. Observations on the Electronic Equipment Employed for Making Measurements on the Pile G 1. Lists the inconveniences encountered in the course of the operation of this equipment. (*In French.*) Réacteur G-1. Observations sur le matériel électronique utilisé pour les mesures sur la pile G 1. ***J. Ailloud, P. Belin, A. Meunier, and A. Tarabella.*** *France, Commissariat a l'Énergie Atomique, Rapport CEA No.* 670 (N), 1957, 11 pp. (QC770 F84.2r Contin.)

919 Study of γ Radiation From Uranium Rods During Deactivation. Concludes by suggesting that radiation diagrams be used in planning the use of industrial irradiators for radiochemical polymerization or the preservation of food products. (*In French.*) Étude du rayonnement γ des barres d'uranium en cours de désactivation. ***F. Balestic.*** *France, Commissariat a l'Énergie Atomique, Rapport CEA No.* 671, 1957, 13 pp. (QC770 F84.2r Contin.)

920 The Influence of the Form of the Cells on the Buckling and Fine Structure of the Thermal Flux in a Heterogeneous Pile. The elementary diffusion equation and the age equation have been solved for lattices assumed to be infinite and periodic. (*In French.*) Influence de la forme des cellules sur le laplacien et structure fine du flux thermique dans une pile hétérogène. ***B. Bailly Du Bois.*** *France, Commissariat a l'Énergie Atomique, Rapport CEA No.* 740, 1957, 33 pp. (QC770 F84.2r Contin.)

921* A Contribution to the Study of the Internal Conversion in the L Underlying Layers by Means of Semicircular Magnetic Spectrography With Pre- and Post-Acceleration. Advantage of knowing the relationships $L_I/L_{II}/L_{III}$. Method to measure them in the proportion of 3 to 4%. Study of the spectrum of internal conversion of the γ radiation of 68 k.e.v. emitted during transmutation $I_o \rightarrow Ra$. (*In French.*) Contribution a l'étude de la conversion interne dans les sous-couches L, par spectrographie magnétique semi-circulaire avec pré- et post-accélération. ***Jacques Delesalle.*** *Journal des Recherches du Centre National de la Recherche Scientifique,* no. 41, Dec. 1957, p. 237-250.

922* Economical Dimensioning of Containers for Conveyance of Isotopes Radiating Gamma Rays. Different types of packing for isotope transportation. Relationship between dimensions, radioactive protection, and expenses. For lead container thickness of 3 cm, the enclosed material thickness should not be more than 1.5 cm and the casing length 24.6 cm. (*In Hungarian.*) Gammasugárzó izotópok szállitótartályainak gazdaságos méretezése. ***László Tithanyi.*** *Közlekedéstudományi Szemle,* v. 8, no. 6, June 1958, p. 262-268.

923* Thermo-Nuclear Research. Brief descriptions of 19 machines are given. *Nuclear Engineering,* v. 3, Oct. 1958, p. 423-427.

924* Interesting Reactor Designs. 1. The High-Temperature Gas-Cooled Reactor. The Zenith, A.G.R., Lenin(ship), and Belgian BR2 reactors are explained and diagrammed. *Nuclear Engineering,* v. 3, no. 31, Oct. 1958, p. 428-434.

925* Measurement of Circular Polarization of γ-Rays. The various methods for the detection of circularly polarized γ-rays are surveyed, and detailed calculations of effects limiting obtainable accuracy. ***Herwig Schopper.*** *Nuclear Instruments,* v. 3, no. 3, Sept. 1958, p. 158-176.

926* A Possible Experiment for Determination of Spirality of μ-Mesons. For the determination of the direction of the μ-meson spin with respect to its momentum it is suggested that circular polarization of X-ray quanta emitted by a mesic atom be investigated. This should simultaneously yield information on the degree of depolarization of μ-mesons after a certain level is reached in the mesic atom. ***A. Z. Dolginov.*** *Nuclear Physics,* v. 7, no. 6, Aug. 1958, p. 569-572.

927* Some Possible Experiments for the Investigation of Inelastic Scattering of Nucleons. Processes of the type $N+N$ $\pi+N+N'$ are considered; they are most frequent in the 650 MeV energy region. ***L. M. Soroko.*** *Nuclear Physics,* v. 7, no. 6, Aug. 1958, p. 579-590.

928* First Order Forbidden β-γ-Correlation for Oriented Nuclei. Explicit formulae for β-γ-correlation of oriented nuclei in first forbidden β-transitions are obtained. All five types of β-interaction are considered and the Coulomb field of an extended nucleus is taken into account. ***A. Z. Dolginov and N. P. Popov.*** *Nuclear Physics,* v. 7, no. 6, Aug. 1958, p. 591-598.

929* A New Development in the Area Method of Neutron Resonance Analysis. The area method has been extended to include the effect of various interference terms which may enter the formula for the neutron resonance cross section. The principal interference term is that between resonance and potential scattering. ***J. E. Lynn.*** *Nuclear Physics,* v. 7, no. 6, Aug. 1958, p. 599-612.

930* Th Low Energy Neutron Resonances of Bismuth. The neutron transmission of Bi was measured as a function of neutron energy between 300 eV and 4000 eV for samples of different thickness. ***J. E. Lynn, M. C. Moxon, and F. W. K. Firk.*** *Nuclear Physics,* v .7, no. 6, Aug. 1958, p. 613-621.

931* The Polarization of Deuterons and Particles of Arbitrary Spin. General formulae are applied to the particular process of elastic scattering of deuterons by He^4 where a narrow resonance is found to exist at the deuteron laboratory energy of 1.069 MeV. ***L. J. B. Goldfarb.*** *Nuclear Physics,* v. 7, no. 6, Aug. 1958, p. 622-642.

932* Measurement of Longitudinal Polarization of Electrons Emitted in β-Decay. The longitudinal polarization of Coulomb β-transition electrons has been measured for several electron energies. The polarization value was found to be equal to $-v/c$ for all the substances measured. It is proved that the most probable relationships among the coupling constants in β-decay are: $C_T = -C'_T$, $C_S = -C'_S$, $C_V = C'_V$, $C_A = C'_A$. ***A. I. Alikhanov, G. P. Eliseiev, and V. A. Liubimov.*** *Nuclear Physics,* v. 7, no. 6, Aug. 1958, p. 655-671.

933* Investigation of Extensive Air Showers Containing Nuclear Active Particles. The exponent of the density spectrum of the electronic component of extensive air showers containing nuclear active particles was determined to be $\gamma=$

1.34 ± 0.08, assuming that the density of nuclear active particles is proportional to the density of electrons in air showers. ***G. Bozóki, E. Fenyves, T. Sándor, and A. Somogyi.*** *Nuclear Physics*, v. 7, no. 6, Aug. 1958, p. 677-686.

934* Proton-Alpha Reactions in Light and Heavy Nuclei. Nuclear emulsion was irradiated with 45 MeV protons, and measurements made on the tracks of alpha-particles emitted from disintegrations of the light and heavy nuclei within it. Draws conclusions on the probability of finding alpha-particles in nuclear matter, and on their momentum distribution. ***P. E. Hodgson.*** *Nuclear Physics*, v. 8, no. 1, Sept. 1958, p. 1-12.

935* Short Range Forces and Nuclear Shell Theory. A procedure for obtaining, in nuclear shell theory, the matrix elements associated with short range interactions between nucleons. ***Marcos Moshinsky.*** *Nuclear Physics*, v. 8, no. 1, Sept. 1958, p. 19-40.

936* Th Use of an Effective Three-Body Potential in the Nucleus. Discusses the possibility of taking into account the state dependence of the Brueckner *t*-matrix by using an effective potential containing a three-body force. ***E. J. Squires.*** *Nuclear Physics*, v. 8, no. 1, Sept. 1958, p. 41-50.

937* Determination of the Relative Σ-Λ Parity. Undertakes to determine whether there are definitive experiments which can determine, at least in principle, the relative Σ-Λ parity. Two such methods are discussed. ***Gordon Feldman and Thomas Fulton.*** *Nuclear Physics*, v. 8, no. 1, Sept. 1958, p. 106-112.

938* Nuclear Moments of Inertia and Effective Nucleon Mass. Moment of inertia may be calculated as the sum of individual-nucleon contributions by treating the dynamics of one sample nucleon in the ellipsoidal harmonic-oscillator potential representing its interaction with the others, on the plausible assumption that the moment of inertia due to all the other nucleons is simply associated with the orientation of the axes of the distortion ellipsoid. ***D. R. Inglis.*** *Nuclear Physics*, v. 8, no. 2, Sept. 1958, p. 125-138.

939* Neutron-Deficient Iridium Isotopes. The known iridium isotopes of masses 190, 189, and 188 were observed, and in addition Ir^{187}, Ir^{186}, and Ir^{185} were identified by means of the threshold energy for their production. ***R. M. Diamond and J. M. Hollander.*** *Nuclear Physics*, v. 8, no. 2, Sept. 1958, p. 143-154.

940* On the Phenomenological Theory of Nuclear Matter. Apart from the energy-dependence of the single-particle potential (effective mass), the rearrangement energy is also taken into account. (*In German.*) Zur phänomenologischen theorie der kernmaterie. ***P. Mittelstaedt.*** *Nuclear Physics*, v. 8, no. 2, Sept. 1958, p. 171-190.

941* Magnetic Moments of Highly Deformed Nuclei. Shows that the values of magnetic moments of odd mass nuclei given by the model of independent particles moving in a spheroidal potential well, deviate from the measured values in a systematic way. ***J. N. L. Gauvin.*** *Nuclear Physics*, v. 8, no. 2, Sept. 1958, p. 213-233.

942 Nuclear Reactor Theory. An outline of reactor design. A general qualitative description of the fission chain reaction, and the concept of critical size, is given. It is shown how theories of slowing down and diffusion of neutrons can be applied to determine the behavior of neutrons in a reactor lattice, and hence the conditions which must be satisfied for a stable chain reaction to be possible. Particular emphasis is given to the heterogeneous graphite-natural-uranium thermal reactor. ***J. J. Syrett.*** 80 pp. 1958. Temple Press, London. (TK9202 Sy82n)

943* Production Cross Section of N^{16} and N^{17}. The gamma-ray dose rate and the fast neutron flux have been measured in air from a source of water shortly after irradiation in the Materials Testing Reactor. Gamma rays from N^{16} and neutrons from N^{17} have been detected. ***Paul A. Roys and Kalman Shure.*** *Nuclear Science and Engineering*, v. 4, Oct. 1958, p. 536-545.

944* Age to Indium Resonance for D-D Neutrons in Water. The average 1.44-ev indium resonance age has been determined from activation measurements for a $D(d,n)He^3$ neutron source in water. The energy of the incident deuteron beam was 250 kev. ***V. Spiegel, Jr., D. W. Oliver, and R. S. Caswell.*** *Nuclear Science and Engineering*, v. 4, Oct. 1958, p. 546-562.

945* The Kinetics of Circulating Fuel Reactors. As the basis for comparison, a relatively "exact" model is used, predicated on perfect mixing in the core and slug flow in the external loop. The derivations and applicability of the various approximate methods are presented. ***John MacPhee.*** *Nuclear Science and Engineering*, v. 4, Oct. 1958, p. 588-597.

946 Effective-Energy Method for Spent-Fuel Shielding. Suitable graphs permit substitution of a single photon energy for a fission-product spectrum. Shielding problems reduce to finding the penetration of photons of this energy. ***Ramon L. Ashley.*** *Nucleonics*, v. 16, Oct. 1958, p. 78-81.

947 Reactor Kinetic Functions: A New Evaluation. Differences in delayed neutron characteristics of the several fuel nuclides make the dynamic behavior of reactors dependent on the fuel used. Accurate calculations show these differences in reactor kinetics. ***G. R. Keepin and T. F. Wimett.*** *Nucleonics*, v. 16, Oct. 1958, p. 86-90.

948* Phenomenological Theory of the *S*-Matrix and *T*, *C* and *P* Invariance. General expressions for the transition matrix are given for reactions between four particles of arbitrary spins. Restrictions imposed by *T*, *C*, or *P* invariance requirements are expressed in terms of simple equations between some phenomenological scalar coefficients which occur in the general expression for the transition matrix. For any given type of reaction one can find in this way definite physical relations which have the advantage of being free of any special assumptions and approximations. ***J. Werle.*** *Nuovo Cimento*, v. 9, ser. 10, no. 4, Aug. 16, 1958, p. 569-585.

949* Slow Mesons Accompanying High Energy Interactions. Four nuclear events were found in G-5 emulsions, exposed in Texas at an altitude of 104,000 feet, where the breakup of the primary or the resulting interaction was accompanied by the emission of slow pions. ***B. Chamany and A. G. Barkow.*** *Nuovo Cimento*, v. 9, ser. 10, no. 4, Aug. 16, 1958, p. 590-599 + 4 plates.

950* Λ°- and θ°-Particles Produced in Iron. The results of an experiment on some properties of Λ° and θ°-particles produced in the plates of a cloud chamber are discussed; 115 V°-events are analyzed by means of angle measurements and ionization estimates. The frequency of production of Λ°, θ°-pairs is found to be small. For neither type of particle is any evidence found for anisotropy in the decays. The V° production cross-section appears larger for a pion primary than for a nucleon, and increases with the energy released in the shower. ***G. Alexander, et al.*** *Nuovo Cimento*, v. 9, ser. 10, no. 4, Aug. 16, 1958, p. 624-646 + 1 plate.

951* On the Mechanism of the (n, 2n) Reaction at 14 MeV Neutron Energy. Neutron spectra emitted by ^9Be, ^{55}Mn, Fe, ^{127}I, and ^{181}Ta under bombardment of 14 MeV neutrons have been measured by using time-of-flight techniques. Continua of the first neutrons are separated from low energy groups due to the second neutrons. Successive emission is predominant for medium weight and heavy nuclei. ***E. Remy and K. Winter.*** *Nuovo Cimento*, v. 9, ser. 10, no. 4, Aug. 16, 1958, p. 664-678.

952* Investigation of the Decay of Polonium-210. Conversion coefficient of 800 keV γ-rays from the decay of Polonium-210 has been measured using scintillation method to be 0.039 ± 0.01. The value of conversion coefficient has also been obtained by the measurement of conversion electrons with an end window type G.M. counter. ***Brat Pal Singh, H. S. Hans, and P. S. Gill.*** *Nuovo Cimento*, v. 9, ser. 10, no. 4, Aug. 16, 1958, p. 699-705.

953* Interactions and Decays of K^--Mesons. III. Analysis of the Stars in Flight. Interactions of K^--mesons in flight with complex nuclei of the nuclear emulsion have been analyzed in 415 cases. ***Y. Eisenberg, et al.*** *Nuovo Cimento*, v. 9, ser. 10, no. 5, Sept. 1, 1958, p. 745-779.

954* The Λ - Hyperon - Nucleon Problem From Meson Theory. A discussion of the implications of the meson theory with regard to the binding of the Λ-hyperon in nuclear matter is carried out taking explicitly into account the phenomenological results of Dalitz and Downs. ***F. Ferrari and L. Fonda.*** *Nuovo Cimento*, v. 9, ser. 10, no. 5, Sept. 1, 1958, p. 842-863.

955 Coupling of Angular Momenta in Odd-Odd Nuclei. . . . is describable as spin-spin coupling if the asymptotic-quantum-number description of particle states is used for deformed nuclei. Coupling rules for these nuclei are given, and all available data are treated by them. ***C. J. Gallagher, Jr. and S. A. Moszkowski.*** *Physical Review*, v. 111, ser. 2, no. 5, Sept. 1, 1958, p. 1282-1290.

956 Levels of Be^{10} and B^{10}. Gamma rays produced in the bombardment of Be^9 (thick target) with 2.8-Mev deuterons were measured with a three-crystal pair spectrometer. The gamma rays are assigned in a consistent manner to decay from known levels of Be^{10} and B^{10}. Using information from stripping reactions it can then be inferred that the spins of the 5.96- and 6.25-Mev levels of Be^{10} are 1- and 2-, respectively. ***W. E. Meyerhof and L. F. Chase, Jr.*** *Physical Review*, v. 111, ser. 2, no. 5, Sept. 1, 1958, p. 1348-1357.

957 Spallation-Fission Competition in Heaviest Elements; Helium-Ion-Induced Reactions in Uranium Isotopes. Most of the reaction cross section is taken up by fission. There is also a pronounced increase of the total cross section for (α,xn) reactions with increasing mass number of the target. ***R. Vandenbosch, T. D. Thomas, S. E. Vandenbosch, R. A. Glass, and G. T. Seaborg.*** *Physical Review*, v. 111, ser. 2, no. 5, Sept. 1, 1958, p. 1358-1373.

958 $C^{12}(p,pn)C^{11}$ Cross Section at 2 and 3 Bev. The measured cross sections for the $C^{12}(p,pn)C^{11}$ reaction are 26.0 ± 0.9 and 26.6 ± 1.0 mb at 2.0 and 3.0 Bev, respectively. From these data and from previously published cross-section ratios, the cross section of the $Al^{27}(p,3pn)Na^{24}$ reaction is found to be 10.4 ± 0.6 and 10.0 ± 0.6 mb at 2.0 and 3.0 Bev, respectively. ***J. B. Cumming, G. Friedlander, and C. E. Swartz.*** *Physical Review*, v. 111, ser. 2, no. 5, Sept. 1, 1958, p. 1386-1394.

959 A Non-Linear Theory of Strong Interactions. A non-linear theory of mesons, nucleons, and hyperons is proposed. ***T. H. R. Skyrme.*** *Royal Society, Proceedings*, v. 247, ser. A, Sept. 16, 1958, p. 260-278.

960 Nuclear Reactor for High-Polymer Research. ***Daniel Greenberg.*** *Rubber and Plastics Age*, v. 39, Sept. 1958, p. 777 + 1 page.

961 On Nucleon-Antinucleon Symmetry in Cosmology. It has been suggested that cosmological models should embody an initial nucleon-antinucleon symmetry and that the present ratio of nucleons to antinucleons is the result of a statistical fluctuation. The authors conclude that one cannot explain the present nucleon-antinucleon asymmetry with a simple argument for a statistical fluctuation without further assumptions. ***Ralph A. Alpher and Robert Herman.*** *Science*, v. 128, Oct. 17, 1958, p. 904.

962 Prospects for Nuclear Propulsion. Discusses some of the design projects now under way towards the practical and economic application of nuclear power to ship propulsion. *Times Review of Industry*, v. 12, Oct. 1958, p. 76.

963 Final Physics Report for the Engineering Test Reactor. The physics of the ETR depends strongly upon the contents of the in-core experimental facilities. In order to properly evaluate the reactor, taking into account the experiments in the core, multi-region, two-dimensional calculations are required. Only the physics which bears on the final design of the ETR is summarized. ***B. Wolfe.*** *U. S. Atomic Energy Commission, AECU-3607* (Vol. I), June 25, 1956, 284 pp. (UF767 U3au Contin.)

964 Steam Explosions During a Violent Reactor Transient. The fission energy released in a heterogeneous, water-moderated reactor manifests itself, in a violent excursion, as a series of steam explosions. ***W. E. Loewe and D. Krucoff.*** *U. S. Atomic Energy Commission, AECU-3659*, Feb. 13, 1958, 50 pp. (UF767 U3au Contin.)

965 Engineering Study on Underground Construction of Nuclear Power Reactors. Outlines and evaluates the pertinent factors, advantages, disadvantages, and cost of constructing a reactor underground, as compared with contained above-ground construction. ***Christian Beck.*** *U. S. Atomic Energy Commission, AECU-3779*, Apr. 15, 1958, 34 pp. (UF767 U3au Contin.)

966 Measurement of the Doppler Temperature Effect in an EBR-1 Type Assembly. The effect was measured by thermally cycling samples of enriched uranium, natural uranium, and plutonium, and detecting the small changes in reactivity. ***W. Y. Kato and D. K. Butler.*** *U. S. Atomic Energy Commission, ANL-5809*, July 1958, 32 pp. (UF767 Un3.1an Contin.)

967 Selected Values of the Physical Properties of Various Materials. Data on various solids, liquids, and gases of concern in nuclear technology are compiled in graphs. ***F. J. Tebo.*** *U. S. Atomic Energy Commission, ANL-5914*, Sept. 1958, 255 pp. (UF767 Un3.1an Contin.)

968 Internal Fuses for Low-Power Reactors. Internal fuses using shaped charges can be applied to fast reactors, since they produce ultrafast fuse reaction. ***T. W. Donaven, S. N. Stilwell, and J. G. Stuart.*** *U. S. Atomic Energy Commission, APEX-397*, Oct. 1953, 21 pp. (UF767 Un3.1ap Contin.)

969 Evaluation of Internally Cooled Liquid Metal Fuel Reactors. Evaluates the internal cooling concept as applied to thermal breeders of the liquid-metal fuel reactor type. Concludes that the externally-cooled concept is preferable. *U. S. Atomic Energy Commission, BAW-1045*, Mar. 1958, 33 pp. (UF767 Un3.1ba Contin.)

970 Simulation of Various Accident Considerations for a Merchant-Ship Pressurized-Water Reactor. A study was conducted on the safety aspects of foreseeable accident types in connection with the Nuclear Merchant Ship Reactor program and the NS "Savannah". Four accidents have been selected for analysis by analog simulation techniques: continuous rod withdrawal, startup, loss of coolant flow, and cold-water insertion. ***Roger S. Boyd, Benjamin B. Gordon, Richard H. Byers, Leon E. Winslow, and J. James Stone, Jr.*** *U. S. Atomic Energy Commission, BMI-1269*, Aug. 25, 1958, 68 pp. (UF767 U3b Contin.)

971 Heavy Water Moderated Power Reactors. Quarterly Progress Report, Feb.-Apr. 1958. Reports on four designs of D_2O-cooled-and-moderated 100-eMW power reactors that are fueled with tubes of natural uranium metal. ***L. Isakoff, compiler.*** *U. S. Atomic Energy Commission, DP-295*, June 1958, 80 pp. (UF767 Un3.1dp Contin.)

972 A Preliminary Evaluation of Gas Cooling of Power Reactors Moderated by Heavy Water. A preliminary study shows that a reactor cooled by helium holds sufficient economic promise to merit further study. ***R. C. Holmes, L. Bernath, and E. W. Hones.*** *U. S. Atomic Energy Commission, DP-307*, Aug. 1958, 50 pp. (UF767 Un3.1dp Contin.)

973 Correlation of Theoretical and Experimental Values of the Ratio of Fast to Thermal Fissions. A multigroup theory has been adapted for use in calculations of fast effect in solid fuel rods. ***M. T. Lee.*** *U. S. Atomic Energy Commission, HW-54687*, June 19, 1958, 27 pp. (UF767 Un3.1hw Contin.)

974 Heat Transfer in the ETR. Review of the heat transfer in the ETR fuel elements to establish the reactor operating parameters. The basic criterion was that the calculated maximum wall temperature in the hot channel be less than or equal to the saturation temperature at the hot spot pressure. ***V. A. Walker.*** *U. S. Atomic Energy Commission, IDO-16461*, Aug. 27, 1958, 12 pp. (UF767 Un3.1id Contin.)

975 Development of Ferritic Stainless Steel—UO_2 Dispersion Fuel Elements. Lowering of UO_2 particle operating temperature was realized and it was learned that ferritic stainless steel is not unduly susceptible to irradiation damage. ***W. K. Barney, W. E. Ray, and H. G. Sowman.*** *U. S. Atomic Energy Commission, KAPL-1908*, Jan 30, 1958, 20 pp. + 2 plates. (UF767 Un3.1ka Contin.)

976 Neutron Spectra Measurements. Thermal neutron spectra have been measured with time-of-flight techniques. Spectra were obtained for pure water and for a nearly homogeneous subcritical assembly where the ratio of thermal absorption to high energy scattering cross section was approximately 0.3. For each medium, spectra were measured at 298 and 586 K. ***R. S. Stone and R. E. Slovacek.*** *U. S. Atomic Energy Commission, KAPL-1916,* Sept. 15, 1957, 30 pp. (UF767 Un3.1ka Contin.)

977 Reactor Technology Quarterly Report No. 4. Metallurgy and Materials. Objective is to report to industry on developments in unclassified reactor technology. *U. S. Atomic Energy Commission, KAPL-2000-1,* Jan. 1958, Sections individually paged. (UF767 Un3.1ka Contin.)

978 Research and Development Program for an OMR Power Plant for Propulsion of a 38,000-DWT Tanker. Presents the research and development program to establish a reference design of an OMR for marine propulsion. *U. S. Atomic Energy Commission, NAA-SR-1880,* Mar. 18, 1957, 11 pp. (UF767 Un3.1na Contin.)

979 Summary of NDA Unclassified Results of Moments Calculations for the Penetration of Neutrons Through Various Materials. Summarizes unclassified results presently available at NDA for the penetration of neutrons through H, water, C, Be, and several hydrocarbons. The moments method was used throughout. ***A. D. Krumbein.*** *U. S. Atomic Energy Commission, NDA-92-2* (Rev.), Aug. 30, 1957, 42 pp. (UF767 Un3.1nd Contin.)

980 A Study of the Nuclear and Physical Properties of the ORNL Graphite Reactor Shield. Investigation shows that the chemical properties and density of the shield have not changed appreciably since a similar investigation in 1948, but its compressive strength is lower (approx. 40% near the reflector-shield interface). ***T. V. Blosser, et al.*** *U. S. Atomic Energy Commission, ORNL-2195,* Sept. 8, 1958, 40 pp. (UF767 U3o Contin.)

981 A Monte Carlo Calculation of Air-Scattered Gamma Rays. For simplicity, the problem was idealized to have a monoenergetic, monodirectional point source of gamma rays in an infinite body of air. The results of the calculation included the angular distributions, energy spectra, and tissue dose rates at source-detector separation distances of from 5 to 100 ft. ***R. E. Lynch, J. W. Benoit, W. P. Johnson, and C. D. Zerby.*** *U. S. Atomic Energy Commission, ORNL-2292,* Oct. 7, 1958, 70 pp. (UF767 U3o Contin.)

982 Components of the Fused-Salt and Sodium Circuits of the Aircraft Reactor Experiment. Methods used for determining compatibility of materials under static and dynamic conditions, standards for materials, and techniques for welding, fabrication, and assembly and the design criteria for pumps, seals, valves, heat exchangers, cold traps, expansion tanks, instrumentation, preheating devices, and insulation are described. ***H. W. Savage, G. D. Whitman, W. G. Cobb, and W. B. McDonald.*** *U. S. Atomic Energy Commission, ORNL-2348,* Sept. 18, 1958, 40 pp. (UF767 U3o Contin.)

983 The ORNL Gas-Cooled Reactor. Advanced Concepts. Design development and materials research and development. *U. S. Atomic Energy Commission, ORNL-2510,* Oct. 2, 1958, 86 pp. (UF767 U3o Contin.)

984 Molten-Salt Reactor Program Quarterly Progress Report for Period Ending June 30, 1958. *U. S. Atomic Energy Commission, ORNL-2551,* Sept. 24, 1958, 106 pp. (UF767 U3o Contin.)

985 A Study of Pre-Acceleration in Beta-Ray Spectroscopy. Studies show that acceleration of beta rays between the source and a beta spectrometer can increase the count rate by increasing the momentum increment transmitted by the spectrometer and can reduce considerably the absorption in the detector window. ***W. O. Olson, H. H. Hubbell, Jr., and R. D. Birkhoff.*** *U. S. Atomic Energy Commission, ORNL-2569,* Oct. 2, 1958, 72 pp. (UF767 U3o Contin.)

986 Analysis of the Recent TSF Secondary Gamma-Ray Experiment. Before a direct comparison could be made between the calculations and the experiment it was necessary to first calculate the spectra of capture and inelastic scattering gamma rays produced in air, then to determine the effect of attenuation and buildup in the water collimator, and, finally, to include the detector response functions. When the calculated and measured pulse-height distributions were compared the shapes were found to be in excellent agreement. ***F. L. Keller and O. S. Merrill.*** *U. S. Atomic Energy Commission, ORNL-2586,* Sept. 23, 1958, 46 pp. (UF767 U3o Contin.)

987 Proceedings of the Conference on Reactions Between Complex Nuclei. A first draft of 26 papers presented at this conference. ***A. Zucker, R. S. Livingston, and F. T. Howard.*** *U. S. Atomic Energy Commission, ORNL-2606,* Oct. 6, 1958, 427 pp. (UF767 U3o Contin.)

988 Tabulated Neutron Cross Sections. I. 0.001-14.5 Mev. Within the limitations of human error, this compilation purports to present these data for total and reaction neutron cross sections for 11 isotopes in the energy range from 0.001 through 14.5 Mev. It is intended that there will be a subsequent part of the tabulation which will extend the energy range and another to tabulate differential neutron cross sections. ***Robert J. Howerton.*** *U. S. Atomic Energy Commission, UCRL-5226,* May 1958, 410 pp. (UF767 U3u Contin.)

989 Bettis Technical Review, Reactor Physics and Mathematics. This eighth issue deals with the accomplishments at Bettis during the six-month period following the fourth issue, WAPD-BT-4. Includes 21 progress reports. *U. S. Atomic Energy Commission, WAPD-BT-8,* June 1958, 155 pp. (UF767 Un3.1wb Contin.)

990* Diffraction Phenomena During Collisions of Fast Particles With Nuclea. Elastic diffraction scattering, diffraction emission of photons by π-mesons, formation of π-meson couple by photon, phenomena during scattering of fast deutrons by nuclea. (*In Russian.*) Difraktsionnye iavleniia pri stolknoveniiakh bystrykh chastits s iadrami. ***A. I. Akhiezer and I. Ia. Pomeranchuk.*** *Uspekhi Fizicheskikh Nauk,* v. 65, no. 4, Aug. 1958, p. 593-630.

991* Angular Distribution of Protons by Means of the Direct Nuclear Photoelectric Effect. The angular distribution of protons, emitted by means of direct *E*1-absorption from the shell model state with angular momentum *l*, is an interference of transfer $l \rightarrow l + 1$ and $l \rightarrow l - 1$. Interference between *E*1 and *E*2-absorption. (*In German.*) Die Winkelverteilung der Protonen beim direkten Kernphotoeffekt. ***J. Eichler and H. A. Weidenmüller.*** *Zeitschrift für Physik,* v. 152, no. 3, 1958, p. 261-271.

992* Fission of Silver Nuclei Induced by High Energy Protons. Some parameters relating to fission of Ag nuclei induced by protons possessing energies between 300 and 660 MeV are investigated. An analysis of the experimental data shows that fission of Ag nuclei induced by high energy protons predominantly leads to the formation of fragments of equal masses; the fission cross section does not significantly vary in the investigated energy range of the incident protons. (*In Russian.*) Delenie iader serebra protonami bol'shoi energii. ***V. P. Shamov.*** *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki,* v. 35, no. 2, Aug. 1958, p. 316-321.

993* Energy Dependence of μ^+—e^+-Decay Asymmetry. The measurements were carried out for electron energies above 20 MeV. The dependence quantitatively agrees with that predicted by the two-component neutrino theory. Experiments indicate that the degree of polarization of the μ-meson beam is 0.81 ± 0.11. (*In Russian.*) Energeticheskaia zavisimost' asimmetrii v μ–e-raspade. ***A. I. Mukhin, E. B. Ozerov, and V. Pontekorvo.*** *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki,* v. 35, no. 2, Aug. 1958, p. 340-347.

994* Photoproduction of Slow π^0-Mesons on Complex Nuclei. Results of measurement of the dependence of the cross section for photoproduction of slow π^0-mesons on the atomic number of the target nuclei are presented for nuclei between C and Pb. The dependence of the yield of slow π-mesons on the maximal γ-ray energy has been measured for C and Pb. The results agree with the theory of production of π-mesons on the surface of the nucleus. (*In Russian.*) Fotoobrazovanie medlennykh π^0-mezonov na slozhnykh iadrakh. ***A. S. Belousov, S. V. Rusakov, and E. I. Tamm.*** *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki,* v. 35, no. 2, Aug. 1958, p. 355-363.

995* On the Capture Mechanism and Limiting Current in Betatrons. The mechanism of electron capture in a betatron is considered by taking into account coulomb interaction of the electrons in the beam and electron losses on the walls of the vacuum chamber. A formula for the limiting current is presented which is also valid for relativistic electron energies. (*In Russian.*) O mekhanizme zakhvata i predel'nom toke v betatronakh. ***A. N. Matveev.*** *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, v. 35, no. 2, Aug. 1958, p. 372-380.

996* On the Interaction Between the Electron and Other Particles at Short Ranges. The possibility of existence of an electron structure and its description from the viewpoint of the linear theory of extended particles, and also of the nonlinear theory, are discussed. Both theories lead to close results for the interaction between the electron and proton, neutron and light nuclei; however, according to the nonlinear theory the interaction between two electrons at very small distances should appreciably differ from that between the electron and positron. (*In Russian.*) O vzaimodeistvii elektrona s drugimi chastitsami na malykh rasstoianiiakh. ***N. N. Kolesnikov and J. A. Jacobi.*** *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, v. 35, no. 2, Aug. 1958, p. 381-391.

997* Formation of Two π-Particles in Collisions Between π-Mesons or γ-Quanta With Nucleons or Deuterons. The production of two π-particles in collisions between π-particles or γ-quanta with nucleons or deuterons is studied by a phenomenological method for small angles of emission of the produced π-particles. (*In Russian.*) Obrazovanie dvukh π-chastits pri stolknoveniiakh π-mezonov i γ-kvantov s nuklonami i deitronami. ***N. V. Dushin.*** *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, v. 35, no. 2, Aug. 1958, p. 401-407.

998* Rotational States of Nonaxial Nuclei. A theory for the energy states and electromagnetic transitions between them. Violation of axial symmetry of the nucleus may not appreciably change the rotational states of axial nuclei but leads to the appearance of new energy states. (*In Russian.*) Vrashchatel'nye sostoianiia neaksial'nykh iader. ***A. S. Davydov and G. F. Filippov.*** *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, v. 35, no. 2, Aug. 1958, p. 440-447.

999* Projective Operators in Elementary Particle Theory. Calculation of various effects for any type of spin particle reduces to the evaluation of the traces of certain combinations of the matrices. (*In Russian.*) Proektivnye operatory v teorii elementarnykh chastits. ***F. I. Fedorov.*** *Zhurnal Eksperimental' noĭ i Teoreticheskoĭ Fiziki*, v. 35, no. 2, Aug. 1958, p. 493-500.

1000* Magnitude of the Particle Losses Caused by Scattering on Residual Gas in Synchrotrons. Attenuation of betatron vibrations in the case of a rectangular vacuum chamber. Considering the problem in a four dimension space. Method to evaluate the amount of particle losses for an arbitrary vacuum chamber. (*In Russian.*) O velichine poter' chastits iz-za rasseianiia na ostatochnom gaze v sinkhrotronakh. ***A. N. Matveev.*** *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 8, Aug. 1958, p. 1829-1836.

1001* Consideration of the Radiation Drag in the Calculation of Shift on a Target of Electrons Accelerated in a Betatron. Study of the decrease of the radius of the electron orbit due to the electromagnetic radiation of electrons moving at very high speed with high energies, in the case of large betatrons. (*In Russian.*) Uchet radiatsionnogo tormozheniia v raschete smeshcheniia na mishen' uskorennykh v betatrone elektronov. ***V. M. Razin.*** *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 8, Aug. 1958, p. 1845-1848.

See also: **86** (biological effects of radiation); **399** (analysis of neutron cross-section data); **860** (metal-ceramic fuel elements).

OPERATIONS RESEARCH AND MANAGEMENT ENGINEERING

1002 Work Sampling—A Tool for Basic Steel Management. Objective is to prove that work sampling can be employed successfully as a substitute for continuous time study in accumulating much of the data essential to analyze some of the problems in basic steel manufacturing. ***A. G. Holzman.*** *Blast Furnace and Steel Plant*, v. 46, Oct. 1958, p. 1070-1074.

1003 Managing Research Laboratories. Studies made recently show that research is gaining appreciation as an operation in itself and that management of this work is rapidly progressing. ***T. M. Linville.*** *Electrical Engineering*, v. 77, Nov. 1958, p. 1001-1006.

1004 Motivation and Human Factors in Engineering Leadership. A brief discussion of the important concepts of motivation and recognition in human relationships. ***L. A. Kilgore.*** *Electrical Engineering*, v. 77, Nov. 1958, p. 1015-1018.

1005 Problems of Engineering Management. Engineers have an underlying fear of criticism which makes supervising them often very difficult. This fear of criticism hinders their effective delegation of work. The aspirant to managerial status should seek out criticism and get used to receiving it. ***Merritt A. Williamson.*** *IRE Transactions on Engineering Management*, v. EM-5, no. 3, Sept. 1958, p. 61-64. (TK1 In6.6em Vis.)

1006 Training of Systems Engineers. Cites that, in the evolution of major systems, many new engineering responsibilities have been created. A critical analysis is made of the systems engineering task to be accomplished and recommendations for action are stated. ***Ralph I. Cole.*** *IRE Transactions on Engineering Management*, v. EM-5, no. 3, Sept. 1958, p. 71-72. (TK1 In6.6em Vis.)

1007 Devices and Developments in Engineering Psychology. Deals with visual indicators and signals, and gives examples of redesigned manual indicators. This is followed by a general discussion of the psychological basis of the design of manual controls and of the practical implications of the psychological data. ***C. B. Gibbs.*** *Iron and Steel Institute, Journal*, v. 190, pt. 2, Oct. 1958, p. 201-204.

1008* Psychological Aspects of Laboratory Work. I. General Introduction. Provides a representative outline of the types of problem arising in laboratory work and develops examples to illustrate how psychological knowledge and techniques may be adapted. ***Roland Harper.*** *Laboratory Practice*, v. 7, Oct. 1958, p. 578-580.

1009 Programing for Complex Projects. Tells what programing is, how to set it up, and how to use it. Precise integration of carefully timed work contributions is necessary to complete the project on time and within the budget. ***R. G. Murdick and A. B. Oppenheim.*** *Machine Design*, v. 30, Oct. 2, 1958, p. 98-103.

1010 Management Aids for Small Business. These 21 papers cover business-government relations; internal general management; and external sources of help, advice, and guidance. ***Edward L. Anthony, editor.*** Annual No. 2. 146 pp. 1958. Small Business Administration. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (HD28 M31 Vis.)

1011* Using the Basic Elements of Management Accounting. Enables the manager or engineer to make decisions based upon facts. ***Geoffrey Bamford.*** *Mechanical World and Engineering Record*, v. 138, Oct. 1958, p. 447-448.

1012 Operational Research in Practice. The development of operational research in NATO countries. An account of what operational research can do and how various operational research techniques have been applied to specific problems and groups of problems. ***Max Davies and Michel Verhulst, editors.*** 201 pp. 1958. Pergamon Press, New York. (QA265 N81o)

1013* A Failure Model for Equipment Undergoing Complex Operation. A simple model for equipment undergoing several cycles of operation is given by an equation. ***David S. Stoller.*** *Operations Research*, v. 6, no. 5, Sept.-Oct. 1958, p. 723-728.

1014* Curiosity, Exploratory Drive, and Stimulus Satiation. Three concepts employed in this area are compared. ***Murray Glanzer.*** *Psychological Bulletin*, v. 55, no. 5, Sept. 1958, p. 302-315.

ORE AND MATERIALS BENEFICIATION

1015* Coal Preparation: The Separation Efficiency of Dense Medium Baths. The dense media from a range of commercial baths have been examined for solids content, contamination, size, flocculation, and viscous properties. ***R. L. Whitmore.*** *Institute of Fuel, Journal,* v. 31, Oct. 1958, p. 422-428 + 1 plate.

1016* New Method of Intensification of Flotation Process. Air-lift centrifugal method of flotation and its advantages. Industrial air-lift centrifugal installation for flotation of coal fines. Qualitative-quantitative indexes of flotation of coal fines by air-lift centrifugal method. Application of this method for concentration of other minerals. (*In Russian.*) Novyi sposob intensifikatsii flotatsionnogo protsessa. ***B. A. Koriakov-Savoĭskiĭ and A. V. Bublikov.*** *Koks i Khimiia,* 1958, no. 9, p. 13-17.

See also: **1170** (Pu extraction processes).

PHYSICS

1017 Heat Transfer in Forced Convection With Internal Heat Generation. A solution to the problem of heat transfer with simultaneous heat generation in viscous tubular flow and an example of heat transfer with frictional heat generation in a non-Newtonian fluid are presented. ***H. L. Toor.*** *A.I.Ch.E. Journal,* v. 4, no. 3, Sept. 1958, p. 319-323.

1018 Reflections From Gradual Transition Sound Absorbers. Reflections from linings for anechoic tanks are treated theoretically by considering the propagation of compressional waves in stratified media. ***Norman B. Miller.*** *Acoustical Society of America, Journal,* v. 30, Oct. 1958, p. 967-973.

1019 Producing Very Short Ultrasonic Impulses With Piezoelectric Oscillations. Possibilities of using the thickness vibrations of barium titanate as a source for short pulses or single pressure impulses. (*In German.*) Die Erzeugung sehr kurzer Ultraschallimpulse mit piezoelektrischen Schwingern. ***J. Koppelmann, R. Frielinghaus, and J. Meyer.*** *Acustica,* v. 8, no. 4, 1958, p. 181-187.

1020* The Unitary Field Theory in Maxwell's Approximation. Application of the unitary theory, when its field equations, in the case of a low electromagnetic field must pass into the general theory of relativity. The unitary theory of Einstein does not comply with this condition. A supplementary scalar density is necessary. (*In German.*) Die unitäre Feldtheorie in der Maxwellschen Näherung. ***Jaroslav Pachner.*** *Annalen der Physik,* v. 2, nos. 1-2, Aug. 1958, p. 36-40.

1021* Study of a High Frequency Type Source of Ions. Measures of the voltage, of the pressure inside the source, of the high frequency power brought into the source, of the output. Qualitative description of the phenomena observed. Results obtained with hydrogen. Maximum pressure, ion extraction, Reifenschweiler's tests. Output increase with high frequency power. (*In French.*) Etude d'une source d'ions du type haute frequence. ***De Lacoste and J. Salmon.*** *Annales de Physique,* v. 3, ser. 13, nos. 5-6, May-June 1958, p. 319-338.

1022* The Form of the Nuclear and Quadrupolar Relaxation Laws in Electronic Resonance. A study of the relationship between the probabilities of transition and the relaxation time in the case of the nuclear, magnetic and quadrupolar resonance and of the paramagnetic electronic resonance and paramagnetic relaxation. (*In French.*) Sur la forme des lois de relaxation en résonance électronique, nucléaire et quadrupolaire. ***François Lurçat.*** *Annales de Physique,* v. 3, ser. 13, nos. 5-6, May-June 1958, p. 339-376.

1023* Properties of an Ionized Gas of Low Density in a Magnetic Field. IV. A systematic method for solving the Boltzmann equation for the steady states of an ionized gas of low density in a strong magnetic field. ***S. Chandrasekhar, A. N. Kaufman, and K. M. Watson.*** *Annals of Physics,* v. 5, Sept. 1958, p. 1-25.

1024* The Magnetic Moment of the Electron. The spin magnetic dipole moment is computed to fourth order in perturbation theory. The procedure is to consider a system of one electron moving in a constant external magnetic field. ***Charles M. Sommerfield.*** *Annals of Physics,* v. 5, Sept. 1958, p. 26-57.

1025* Time-Independent Nonrelativistic Collision Theory. E. Gerjuoy. *Annals of Physics,* v. 5, Sept. 1958, p. 58-93.

1026 Introducing Magnetohydrodynamics. Research in this area is leading to new space propulsion systems, as well as re-entry "drag devices" and electric power generators. ***Arthur Kantrowitz.*** *Astronautics,* v. 3, Oct. 1958, p. 18 + 6 pages.

1027 The Performance of Bismuth Telluride Thermojunctions. The thermoelectric properties of *n*-type and *p*-type bismuth telluride between 150 and 300 K have been measured and the figure of merit for thermoelectric applications has been calculated. ***H. J. Goldsmid, A. R. Sheard, and D. A. Wright.*** *British Journal of Applied Physics,* v. 9, Sept. 1958, p. 365-370.

1028 Low Temperature Behavior of Debye Characteristic Temperatures. *G. K. Horton and H. Schiff.* *Canadian Journal of Physics,* v. 36, Sept. 1958, p. 1127-1130.

1029 Zeeman Splitting of Donor States in Germanium. The linear Zeeman effect of the $2p\,m = \pm 1$ donor states is calculated in the effective mass approximation. The resulting level splitting is independent of the longitudinal mass characterizing the ellipsoidal conduction band energy surfaces. The result is valid as long as the Zeeman splitting of the $m = \pm 1$ states is small compared to the energy difference between the $2p\,m = 0$ and the $2p\,m = \pm 1$ states. ***R. R. Haering.*** *Canadian Journal of Physics,* v. 36, Sept. 1958, p. 1161-1167.

1030* Thermoelectrical Properties of Antimony Telluride and of the Solid Solutions of Sb_2Te_3-Bi_2Te_3. In the system Sb-Te, there was an increase of the thermoelectric power α and of resistivity ρ with Te concentration. The solid solutions Sb_2Te_3-Bi_2Te_3 are of the *p* type as their constituents. (*In French.*) Propriétés thermoélectriques du tellurure d'antimoine et des solutions solides Sb_2Te_3-Bi_2Te_3. ***Hilmi Benel.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences,* v. 247, no. 5, Aug. 4, 1958, p. 584-587.

1031* Increase of the Photoconductivity of Single Crystals of Cadmium Sulfide by Means of Radiation in an Atomic Pile. This radiation in an atomic pile under a flux of the order of 10^{13} neutrons/cm^2, cause a definite increase of sensitiveness in the visible region and for the X-rays, due to the holes created in the crystal lattice by the neutron shock. (*In French.*) Accroissement de la photoconductivité des monocristaux de sulfure de cadmium par irradiation dans une pile atomique. ***Michel Martineau.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences,* v. 247, no. 6, Aug. 11, 1958, p. 639-643.

1032* Effect of the Adsorption State on the K Absorption Spectra of Cobalt. The effect was revealed by comparing the K absorption spectra of cobalt given by the pure sulfate, chloride, nitrate and acetate of this metal, and the spectra of the same substances absorbed on magnesia. (*In French.*) Influence de l'état d'adsorption sur les spectres d'absorption K du cobalt. ***M. Paul Sakellaridis.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences,* v. 247, no. 12, Sept. 22, 1958, p. 876-879.

1033* Equations for the Green Functions in Quantum Electrodynamics. *Jan Fischer.* *Czechoslovak Journal of Physics* v. 8, no. 4, 1958, p. 379-389.

1034* Electron Emission From Graphite Caused by Incidence of Mercury Ions. A brief explanation is given of the process of the liberation of electrons from a solid target as a result of incident positive ions, as well as a survey of the results of known experiments. ***Jaroslav Kramář and Stanislav Láska.*** *Czechoslovak Journal of Physics,* v. 8, no. 4, 1958, p. 457-470.

1035 Operation High Temperature. A sun-hot flame, whose temperature can't be measured, but only calculated, is produced by a new electric arc machine. ***Melvin Mandell.*** *Dun's Review and Modern Industry,* v. 72, no. 4, Oct. 1958, p. 38 + 6 pages.

1036* Measure of the Velocity of Ultrasonics in Fluids Under Pressure by Means of the Pulse Method. Velocity of

ultrasonics in N, A, standard sea water as function of pressure 1 to 1200 at. and temperature, 25 to 100 C. Successive echos obtained by reflexion ultrasonic pulse waves (5M cycles) were used. Excellent results in the case of distilled water and sea water. Determination of attenuations in compressed gases. (*In French.*) Mesure de la vitesse des ultrasons dans les fluides sous pression par la méthode des impulsions. ***Albert V. J. Martin.*** *Journal des Recherches du Centre National de la Recherche Scientifique,* no. 41, Dec. 1957, p. 251-272 + 2 plates.

1037 Additivity Rules for the Estimation of Molecular Properties. Thermodynamic Properties. A general limiting law is proposed and stated which can be used to systematize the various laws of additivity of molecular properties. ***Sidney W. Benson and Jerry H. Buss.*** *Journal of Chemical Physics,* v. 29, Sept. 1958, p. 546-572.

1038* Non-Linear Theory of Plasma Oscillations and Waves. A non-linear equation is derived; only Coulomb interactions between electrons are considered. ***S. Amer.*** *Journal of Electronics and Control,* v. 5, no. 2, Aug. 1958, p. 105-113.

1039* Photoconductivity in Lead Selenide. ***D. H. Roberts.*** *Journal of Electronics and Control,* v. 5, no. 3, Sept. 1958, p. 256-269.

1040* Optical T-Bench Method of Measuring Longitudinal Spherical Aberration. This method of measuring longitudinal spherical aberration and longitudinal chromatic aberration has been used for lenses having focal lengths ranging from 2 in. to 15 ft. and having apertures ranging from 0.5 to 12 in. ***Francis E. Washer.*** *Journal of Research, National Bureau of Standards,* v. 61, no. 1, July 1958, p. 31-39.

1041* The Effect of Using Electron Collection in a Cylindrical, Pulse Ionization Chamber. Ionizing trajectories crossing the chamber from end to end, and ideal conditions are assumed. The probability of observing pulses of a given amplitude is shown to depend on this amplitude. The resulting statistical distribution of pulse amplitudes to be expected under typical conditions of operation is calculated as an example from Landau's theoretical distribution of energy loss. (*In French.*) Effets causés par la collection des électrons dans une chambre d'ionisation cylindrique. ***Georges Hall.*** *Nuclear Instruments,* v. 3, no. 3, Sept. 1958, p. 121-126.

1042* Phenomenological Analysis of Reactions of the a + a′ → b + b′ Type. Conditions for the construction from experimental data of the matrix for reactions of the a + a′ → b + b′ type are considered on the basis of general principles of quantum mechanics. ***S. M. Bilenky, L. I. Lapidus, L. D. Puzikov, and R. M. Ryndin.*** *Nuclear Physics,* v. 7, no. 6, Aug. 1958, p. 646-654.

1043* Observation in Quantum Mechanics. Gives an explanation of how the indeterminacy of a quantum-mechanical observable is removed by the process of measurement. Points out that the observation of an individual micro-system is possible only by means of its interaction with a macroscopic system in a metastable state. ***H. S. Green.*** *Nuovo Cimento,* v. 9, ser. 10, no. 5, Sept. 1, 1958, p. 880-889.

1044 Optical Aberration Coefficients. III. The Computation of the Tertiary Coefficients. IV. The Coefficient of Quaternary Spherical Aberration. A computing scheme for the full set of primary, secondary, and tertiary monochromatic aberration coefficients of symmetrical optical systems composed of spherical surfaces; also coefficients of higher order. ***H. A. Buchdahl.*** *Optical Society of America, Journal,* v. 48, Oct. 1958, p. 747-759.

1045 Antireflection Coatings for Germanium and Silicon in the Infrared. Very hard and durable single layer antireflection coatings for Ge and Si have been made which result in a peak transmittance of better than 98% at any desired wavelength in the infrared up to about 15 μ. Silicon monoxide makes an excellent antireflection coating for Si and Ge in the near infrared, but cannot be used in the 10-μ region where it becomes strongly absorbing. Zinc sulfide has been found to be the most suitable antireflecting material at the longer wavelengths. ***J. T. Cox and G. Hass.*** *Optical Society of America, Journal,* v. 48, Oct. 1958, p. 677-680.

1046 Stark Effect in Argon. II. Stark effect shifts have been measured for some twenty lines in the ultraviolet spark spectrum of argon. The apparatus used consisted of a hollow cathode discharge which acted as a source from which ions could be drawn into a field space. ***Leon Maissel.*** *Optical Society of America, Journal,* v. 48, Nov. 1958, p. 853-856.

1047 An Interpretation of Certain Transport Properties in Germanium Containing Parallel Arrays or Edge Dislocations. The anisotropy of the diffusion constant and high field mobility in N-type crystals is considered quantitatively. ***A. F. Gibson and E. G. S. Paige.*** *Philosophical Magazine,* v. 3, no. 33, Sept. 1958, p. 950-960.

1048 Ambipolar Transport of Carrier Density Fluctuations in Germanium. The spectrum of generation-recombination noise in semi-conductors may differ from the usual form at relatively high field strengths or relatively short drift times of the carriers. It is shown that such a modification occurs only if the ambipolar drift velocity is sufficiently large. From the "resonances" in the spectra the ambipolar drift time was determined and found to be in good agreement with the calculated values. ***J. E. Hill and K. M. Van Vliet.*** *Physica,* v. 24, Sept. 1958, p. 709-720.

1049 Mobility of Electrons and Holes in PbS, PbSe, and PbTe Between Room Temperature and 4.2°K. ***Robert S. Allgaier and Wayne W. Scanlon.*** *Physical Review,* v. 111, ser. 2, no. 4, Aug. 15, 1958, p. 1029-1037.

1050 Crystal Structure and Ferrimagnetism in $NiMnO_3$ and $CoMnO_3$. X-ray diffraction studies of individual crystals of $NiMnO_3$ and $CoMnO_3$. ***W. H. Cloud.*** *Physical Review,* v. 111, ser. 2, no. 4, Aug. 15, 1958, p. 1046-1049.

1051 Absorption of Light by Colloids in Alkali Halide Crystals. The thermal transformation of *F* centers into colloid has been observed in NaCl. The transformation occurs with constant integrated absorption cross section. A theory of the colloid band based upon the free electron model of the alkali metal and Mie's theory of the absorption of light by conducting spheres is presented. ***William T. Doyle.*** *Physical Review,* v. 111, ser. 2, no. 4, Aug. 15, 1958, p. 1067-1072.

1052 Quantum-Mechanical Kinetic Energy Transformation. It is shown that by a transformation of the usual expression for the kinetic energy matrix elements a simpler formula results which yields, for numerical wave functions, higher numerical accuracy for the kinetic energy than has previously been obtained. ***A. J. Freeman and P. O. Löwdin.*** *Physical Review,* v. 111, ser. 2, no. 5, Sept. 1, 1958, p. 1212-1213.

1053 Predicted Radiation of Plasma Oscillations in Metal Films. The yield is computed to be one photon for every one thousand electrons incident at 10 kev. The radiation is at the plasma frequency, ωp, or at 2100 A for a sodium film. ***Richard A. Ferrell.*** *Physical Review,* v. 111, ser. 2, no. 5, Sept. 1, 1958, p. 1214-1222.

1054 Ferrimagnetic Resonance in $NiMnO_3$. Ferrimagnetic resonance in single crystals of hexagonal $NiMnO_3$ has shown that the magnetic anisotropy is axial and the easy direction of magnetization lies in the basal plane. The magnetic anisotropy field $2K/M$ equals 5.2×10^4 gauss, corresponding to an anisotropy energy of 2.6×10^6 ergs/cm^3. Resonance could not be observed at any orientation in single crystals of the isomorphous compound $CoMnO_3$. ***H. S. Jarrett and R. K. Waring.*** *Physical Review,* v. 111, ser. 2, no. 5, Sept. 1, 1958, p. 1223-1226.

1055 Fine Structure in the Absorption-Edge Spectrum of Si. Measurements of the absorption spectrum of Si, made with high resolution, near the main absorption edge, at various temperatures between 4.2 K and 415 K, have revealed fine structure in the absorption on the long-wavelength side of this edge. ***G. G. Macfarlane, T. P. McLean, J. E. Quarrington, and V. Roberst.*** *Physical Review,* v. 111, ser. 2, no. 5, Sept. 1, 1958, p. 1245-1254.

1056 Thermal Diffusion in Ionized Gases. Thermal diffusion in mixed gases depends on a "thermal diffusion factor" α, which is less than unity in all known neutral gas mixtures (in which the particles have no electric charge). This factor seems to be greatest for the ions of different kinds in a mixed ionized

gas, composed mainly of electrons and light ions of small charge Ze, with a small admixture of heavy ions of greater charge $Z'e$. ***Sydney Chapman.*** *Physical Society, Proceedings,* v. 72, Sept. 1958, p. 353-362.

1057 Galvanomagnetic Effects in p-Type Bismuth Telluride. The resistivity components, Hall coefficients and low field magneto-resistance coefficients were measured on a number of single crystal specimens of p-type bismuth telluride at 77 K. Results are shown to be consistent with a many-valley form of the valence band for which the energy extrema are on the reflection planes in momentum space. ***J. R. Drabble.*** *Physical Society, Proceedings,* v. 72, Sept. 1958, p. 380-390.

1058 The Measurement at Low Frequencies of the Dielectric Constant of Conducting Liquids. The dielectric constants of aqueous solutions of the chlorides of Li, Na, K, Rb, and Cs were measured over the concentration range 10^{-4} to 10^{-2} normal at 25 C, using a novel form of electrometer. An accuracy to ± ½% is claimed, and the results indicate that the fall in dielectric constant at concentrations below 10^{-3} normal is proportional to the square root of the concentration. ***V. I. Little.*** *Physical Society, Proceedings,* v. 72, Sept. 1958, p. 441-446.

1059 Paramagnetic-Resonance Spectrum of Gadolinium in Single Crystals of Thorium Oxide. Spectrum has been analyzed at 290 and 90°K at 3 cm. wavelength. The positions and intensities of the lines are explained by a crystalline field of cubic symmetry. ***W. Low and D. Shaltiel.*** *Physics and Chemistry of Solids,* v. 6, no. 4, Sept. 1958, p. 315-323.

1060 The Plasma in a Magnetic Field. A Symposium on Magnetohydrodynamics. A new branch of physical science that studies how magnetic fields influence and are influenced by the motion of electrically conducting fluids, and shows how individual orbit analysis of important configurations can be either simplified by the use of adiabatic invariants or bypassed by a modified macroscopic theory. The use of magnetic fields appears to be the most promising means for confining a hot deuterium plasma long enough to produce controlled thermonuclear power. However, the interface between a plasma and a magnetic field tends to be unstable and evidence is presented for such an instability from both pinch effect studies and astrophysical observations. ***Rolf K. M. Landshoff, editor.*** 130 pp. 1958. Stanford University Press, Stanford, Calif. (QC809.M3 L23p)

1061 A Qualitative Investigation of the Wave Functions of Metallic Uranium. Investigators considered only the body-centered cubic phase of U. Imagining the Rn core to contribute a spherical potential within each cell, they calculated rough wave functions for the valence electrons. They reduced the problem to a spherical one by replacing the atomic polyhedron by the Wigner-Seitz sphere of equal volume and applying their boundary conditions on the surface of this sphere. ***E. Cicely Ridley.*** *Royal Society, Proceedings,* v. 247, ser. A, Sept. 16, 1958, p. 199-213.

1062 The Freezing Point of Zinc as a Primary Point of the International Temperature Scale. The technique is described of achieving the highest accuracy of measurement with platinum-resistance thermometers at the freezing point of Zn and the boiling point of S. The two points are compared in a series of measurements and it is found that the Zn point is three or four times more reproducible than the S point. It was concluded that the substitution of the Zn point for the S point as a primary fixed point of the International Temperature Scale would lead to a greater precision in the definition of the scale. The value of the freezing point of Zn is found to be 419·5055 ± 0·002 C. ***C. R. Barber and Anne Horsford.*** *Royal Society, Proceedings,* v. 247, ser. A, Sept. 16, 1958, p. 214-224.

1063 The Structure of Ice. A critical resumé of three ice structures known to exist: the normal hexagonal, tridymite-type structure; a cubic, cristobalite-type structure; and an amorphous structure. ***Kathleen Lonsdale.*** *Royal Society, Proceedings,* v. 247, ser. A, Oct. 21, 1958, p. 424-434.

1064 Infra-Red and Raman Spectra of Single Crystals of Ice. A study to determine if infra-red analyses could be used to discriminate between various proposals which have been put forward for the positions of the H atoms in the hexagonal crystal lattice formed by the O atoms. ***N. Ockman and G. B. B. M. Sutherland.*** *Royal Society, Proceedings,* v. 247, ser. A, Oct. 21, 1958, p. 434-440.

1065 Lattice Disorder and Physical Properties Connected With the Hydrogen Arrangement in Ice Crystals. Present knowledge of the H positions and of the physical properties sensitive to the H arrangement in ice crystals is reviewed. All possibilities of configurational changes in the ideal and the real crystal are considered. ***H. Gränicher.*** *Royal Society, Proceedings,* v. 247, ser. A, Oct. 21, 1958, p. 453-461.

1066 Theoretical Physics. The main thesis is that theoretical physics is built upon a limited number of fundamental laws or principles which, with the help of mathematics, may be expressed in various mathematical forms and then applied to the analysis of specific problems of interest. ***F. Woodbridge Constant.*** 281 pp. 1954. Addison-Wesley, Reading, Mass. (QA807 C76t)

1067* Propagation of Long Electric Waves in Magnetized Plasmas and Their Passage Through Plasma Layers. Propagation of electromagnetic waves in vaporized plasmas with low frequencies, that is $\omega < \upsilon$ (υ impact number). Without a magnetic field and during propagation across the magnetic field, the plasma acts as a conductor. During propagation along the magnetic field, the plasma behaves as a conductor also for $\omega < \upsilon$. (*In German.*) Über die Ausbreitung langer elektrischer Wellen in manetisierten Plasmen und ihren Durchgang durch Plasmaschichten. ***Winfried Otto Schumann.*** *Zeitschrift für Angewandte Physik,* v. 10, no. 9, Sept. 1958, p. 428-433.

1068* Contribution to the Linear Field Theory. V. (An Asymmetrical Effect Principle.) The 16 symmetrical equations deductible from the 16 field equations agree for $\epsilon = \mathfrak{y} = 0$ exactly with Einstein's gravitation equation for vacuum. The remaining 6 antisymmetrical equations are of the first order for $\epsilon = \mathfrak{y} = 0$. (*In German.*) Zur linearen Feldtheorie. V. (Ein asymmetrisches Wirkungsprinzip.) ***Willy Scherrer.*** *Zeitschrift für Physik,* v. 152, no. 3, 1958, p. 319-327.

1069* On the Temperature of the Electrons in a Plasma in a Variable Electric Field. It is shown that the electron gas can exist in two stable states with different temperatures; transition from one state to another occurs at certain critical values of the emplitude and is accompanied by an appreciable change in the electron temperature. (*In Russian.*) O temperature elektronov v plazme v peremennom elektricheskom pole. ***A. V. Gurevich.*** *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki,* v. 35, no. 2, Aug. 1958, p. 392-400.

1070* Investigation of Particle-Like Solutions of the Nonlinear Scalar Field Equation. Relation between the field energy of these solutions for a complex scalar field and the equation parameters and frequency of the oscillations. The first three particle-like solutions are derived and the relevant mass spectrum is analyzed by numerical integration for the case of the simplest cubic nonlinear term. (*In Russian.*) Issledovanie chastitsepodobnykh reshenii nelineinogo uravneniia skaliarnogo polia. ***V. B. Glasko, F. Lerinst, Ia. P. Terletskii, and S. F. Shushurin.*** *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki,* v. 35, no. 2, Aug. 1958, p. 452-457.

1071* Splitting of Atomic Terms With Integer Total Angular Momenta in a Magnetic Crystal. A method is proposed for determination of degeneracy due to magnetic symmetry. It is employed in an analysis of the splitting of atomic terms in a magnetic crystal for all cases of magnetic symmetry, under the assumption that the total angular momentum of the atom is an integer. (*In Russian.*) Rasshcheplenie atomnykh termov s tselochislennym polnym momentom v magnitnom kristalle. ***B. A. Targer.*** *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki,* v. 35, no. 2, Aug. 1958, p. 467-473.

1072* Dependence of the Hall Constant on the Temperature and Strength of a Magnetic Field in *p* Germanium. The dependence at room temperature and at −145 C was very high in weak fields. With strength >4000 oersteds at −145 C and with strength >8000 oersteds at room temperature, there is full saturation. Increase of the Hall constant up to 30% of its value at low temperatures when strength = 2200 oersteds. (*In Russian.*) Zavisimost' postoiannoĭ Kholla ot temperatury i napriaz-

hennosti magnitnogo polia v germanii *p* tipa. ***V. I. Stafeev and V. M. Tuchkevich.*** *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 8, Aug. 1958, p. 1642-1645.

1073* Ferromagnetic Resonance in Some Ferrites at Low Temperatures. The frequency in the ferrites ($NiO.ZnO.Fe_2O_3$ and $Li_2O.ZnO.Fe_2O_3$ with different molar percentage content) was about $9.4.10^9$ cycles. Significant decrease of the spectroscopic division when passing from 290 K to the temperature of liquid He (4.2 K). (*In Russian.*) Ferromagnitnyĭ rezonans v nekotorykh ferritakh pri nizkikh temperaturakh. ***N. I. Krivko.*** *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 8, Aug. 1958, p. 1703-1710.

1074* Vibrations of the Electron Plasma in the External Electric and Magnetic Field. Propagation of electromagnetic waves in the plasma existing in crossed electrical and magnetic fields and calculation of the hot motion of the electrons. (*In Russian.*) O kolebaniiakh elektronnoĭ plazmy vo vneshnikh elektricheskom i magnitnom poliakh. ***K. N. Stepanov and V. S. Tkalich.*** *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 8, Aug. 1958, p. 1789-1800.

1075* Thermoelectromotive Force and the Additional Heat Conductivity of Heterogeneous Systems. Calculation of thermoelectromotive force coefficient of a polycrystal, increase of polycrystal heat conductivity, provoked by heterogeneity of its thermoelectrical properties, and thermoelectromotive force coefficient of matrix system in the case of low concentration of matrix phase and low concentration of inclusions. (*In Russian.*) Termoelektrodvizhushchaia sila i dobavochnaia teploprovodnost' geterogennykh sistem. ***S. V. Airapetiants, and M. S. Bresler.*** *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 9, Sept. 1958, p. 1935-1938.

1076* Effect of Nonuniform Electric Field on Diffusion of Excitons. Suitable for many cases for solution of a diffusion equation which includes terms describing effect of nonuniform field on excitons in the region of curvature zone in surface adjacent area. (*In Russian.*) Vliianie neodnorodnogo elektricheskogo polia na diffuziiu eksitonov. ***Z. S. Gribnikov and E. I. Rashba.*** *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 9, Sept. 1958, p. 1948-1958.

See also: **974** (reactor heat transfer).

PLASTICS

1077* Polymerization of Styrene in Emulsion Initiated by the System Cumene-Triethylenetetramine Hydroperoxide. Study of the kinetics of reaction between cumene hydroperoxide and triethylenetetramine in soap solutions and emulsions, and kinetics of polymerization reaction of styrene in emulsion under effect of mentioned initiator. Establishing dependence of reaction rate on concentration of reaction components. Some assumptions on mechanism of the reaction. (*In Russian.*) Polimerizatsiia stirola v emul'sii pod vliianiem initsiiruiushcheĭ sistemy gidroperekis' kumola—trietilentetramin. ***S. D. Razumovskiĭ and S. S. Medvedev.*** *Akademiia Nauk SSSR, Izvestiia, Otdelenie Khimicheskikh Nauk*, 1958, no. 9, Sept., p. 1088-1093.

1078 Polymeric Peroxide of 1,3-Butadiene. Controlled peroxidation of butadiene solutions produces, in high yield, polymer of molecular weight 700-850 comprising vinylethylenedioxy and 2-butenylenedioxy units. ***C. T. Handy and H. S. Rothrock.*** *American Chemical Society, Journal*, v. 80, Oct. 5, 1958, p. 5306-5308.

1079* Age of the Plastic Roof. Considers the role of plastics in roof construction. The various materials used for insulation, coatings, and sheeting are discussed. ***David Allison.*** *Architectural Forum*, v. 109, no. 4, Oct. 1958, p. 144-149.

1080 The Creep of Low Density Polythene. Emphasizes that the creep of a polythene specimen is very dependent upon its thermal history. ***E. A. W. Hoff, P. L. Clegg, and K. Sherrard-Smith.*** *British Plastics*, v. 31, Sept. 1958, p. 384-389.

1081 Epoxide Resins in Electrical Components. *British Plastics*, v. 31, Sept. 1958, p. 390-391.

1082 Low Temperature Cracking Test for Plasticized P.V.C. Tester for working at −5 C is described. Several compositions are examined. ***D. Wormald.*** *British Plastics*, v. 31, Sept. 1958, p. 392 + 4 pages.

1083* Polymerization of Methyl Methacrylate Initiated by a Combined Action of Trichloroacetic Acid and Dimethylaniline. Presents the results of experiments on the dependence of the initial rate of polymerization of methyl methacrylate upon the concentrations of both trichloroacetic acid and dimethylaniline. A bimolecular reaction between trichloroacetic acid and dimethylaniline to form radicals is suggested as the initial reaction of the polymerization. ***Ryoichi Uehara.*** *Chemical Society of Japan, Bulletin*, v. 31, no. 6, Sept. 1958, p. 685-687.

1084* Copolymerization of Ethylene With Aliphatic α-Olefins. IV. Ethylene-Propylene Copolymerization Induced by Vanadium Trichloride Derived Catalysts. Describes the characteristics of aforementioned copolymers and the influence on copolymer composition of different parameters connected with catalyst preparation. (*In Italian.*) Copolimerizzazione dell'etilene con le α-olefine alifatiche. IV. Copolimerizzazione etilene-propilene con catalizzatori preparati da tricloruro di vanadio. ***G. Natta, G. Mazzanti, A. Valvassori, and G. Sartori.*** *Chimica e l'Industria*, v. 40, Sept. 1958, p. 717-724.

1085* Effects of Composition, Curing Conditions, and Fillers on Dynamic Mechanical Properties and on Structure of Phenol-Formaldehyde Resins. These effects were investigated by means of the determination of the velocity of sound and the damping factor by an electrostatic method at middle frequency in a temperature range from −60 to 200 C. (*In Italian.*) Effetti della composizione, delle condizioni di trattamento e delle cariche sulle proprietà meccaniche dinamiche e sulla struttura di resine fenolo-formaldeide. ***M. Baccaredda and E. Butta.*** *Chimica e l'Industria*, v. 40, Sept. 1958, p. 732-735.

1086 Reinforced Plastics for Corrosion Control. Test results illustrate the versatility of reinforced plastics in solving corrosion problems. Special study was made of resistance to solvents, organic acids, and concentrated inorganic acids, which may be termed "fringe" applications for plastics. The objective is to illustrate the differences between various polyesters and epoxies in specific chemicals. ***W. A. Severance.*** *Corrosion*, v. 14, Oct. 1958, p. 29-32.

1087 Electron Spin Resonance Spectra of Some γ-Irradiated Polymers. The spectra of a number of γ-irradiated polymers, mostly of the polyvinyl series, were measured. The appearance of a new spectrum on introducing air was noted in some cases. A few tentative interpretations of the hyperfine patterns are made. ***R. J. Abraham and D. H. Whiffen.*** *Faraday Socity, Transactions*, v. 54, Sept. 1958, p. 1291-1299.

1088 High Temperature Laminating Resins. The effect of structure of the cross-linking agent on the high temperature resistance of polyester laminating resins was investigated. A combination of β-hydroxyethyldiallyl cyanurate and ethylene glycol maleate gave the best high temperature resistant laminates. ***Merrill Cohen and George A. Cypher.*** *Industrial and Engineering Chemistry*, v. 50, Oct. 1958, p. 1541-1546.

1089 Onset Test for Stability of Uncatalyzed Polymerizable Materials. The polymerization curve obtained is characteristic of the system under study and can be used by manufacturer and fabricator in control of new and stored resins. ***T. E. Bockstahler, A. P. Kotloby, E. M. Beavers, F. H. Zimmerli, and O. C. Kohler.*** *Industrial and Engineering Chemistry*, v. 50, Oct. 1958, p. 1581-1582.

1090 Thermal and Oxidative Degradation of Silicones. Variously substituted silicones were exposed to the action of O and heat to investigate the degradation reactions occurring at high temperatures in the presence of air. The rates of O absorption by, and evolution of gases from methyl-, vinyl-, and phenyl-containing silicones were determined. Phenyl silicones were the most resistant to oxidation, followed by methyl- and vinyl-substituted silicones. ***Luciano C. Scala and William M. Hickam.*** *Industrial and Engineering Chemistry*, v. 50, Oct. 1958, p. 1583-1584.

1091* Atomic Radiation and Polymer Science. Covers polymerization by radical and ionic mechanisms; radiation induced grafting; crosslinking and degradation; the effect of fillers and additives. ***A. Charlesby.*** *Institution of the Rubber Industry, Transactions*, v. 34, no. 4, Aug. 1958, p. 175-199.

1092* Methods of Fabricating Laminated Plastic Printed Circuits. II. A review of important methods. In missile applications, use of the printed circuit, coupled with that of the transistor, has made possible the space-saving modular approach in equipment design. ***Aram Henesian.*** *Insulation*, v. 4, Oct. 1958, p. 20-22.

1093* Effect of Crystallinity on Radiation Effects in Polyethylene. *G* value for crosslinking does not differ considerably in amorphous or crystalline regions; lower gel dose for the low density, highly branched polymer is due to its higher wt. average mol. wt. ***A. Charlesby, E. Von Arnim, and L. Callaghan.*** *International Journal of Applied Radiation and Isotopes*, v. 3, no. 3, Aug. 1958, p. 226-231.

1094 Syntheses of Metal-Complexing Polymers. III. Polymers Containing α-Hydroxyphosphonic Acid and Related Groupings. The reaction of salicylaldehyde and resorcaldehyde with dialkyl phosphites or with phosphorous acid was used as a basis for the preparation of high-capacity phosphonic acid complexing resins. ***E. S. Lane.*** *Journal of Applied Chemistry*, v. 8, Oct. 1958, p. 687-690.

1095 Mechanical Behavior of a Polymer at Temperatures Through the Glass Transition Temperature. Stress-temperature and length-temperature measurements were made on Paracril-35 (a butadiene-acrylonitrile copolymer) in the temperature range −80 to 25 C which includes the glass-like, transition, and rubber-like states for this material. ***J. R. Stevens and D. G. Ivey.*** *Journal of Applied Physics*, v. 29, Oct. 1958, p. 1390-1394.

1096 Dynamic Mechanical Behavior of Irradiated Polyethylene. Samples of a "high-density" polyethylene irradiated to thermal neutron doses as high as 2.9×10^{18} nvt and of "low-density" polyethylene subjected to gamma-ray bombardment up to a dosage of 1×10^{9} rep were investigated by dynamic mechanical methods from 80 K to 450 K at audio-frequencies. ***C. W. Deeley, J. A. Sauer, and A. E. Woodward.*** *Journal of Applied Physics*, v. 29, Oct. 1958, p. 1415-1421.

1097 Viscoelastic Properties of Concentrated Solutions of Polyvinyl Alcohol. The dynamic viscosity and rigidity of concentrated solutions of polyvinyl alcohol samples having different molecular weights were measured within the ranges of frequencies from 0.08 to 400 cps and the temperature range from 20 to 55 C. The effects of concentration, temperature, and molecular weight on the zero shear viscosity were examined quantitatively. ***Shigeharu Onogi, Isao Hamana, and Hidefumi Hirai.*** *Journal of Applied Physics*, v. 29, Oct. 1958, p. 1503-1510.

1098* Stabilization of Viscose Rayon by Heat Treatment. Viscose fibers preswollen by treatment with very dilute H_2SO_4 solutions of various concentrations were heat treated at 60-200 C and the effects studied. ***Kisou Kanamaru, Noboru Tokita, and Susumu Noyama.*** *Journal of Polymer Science*, v. 31, Sept. 1958, p. 359-382.

1099* Dielectric Properties of Polymonochlorotrifluoroethylene. The dielectric properties of three kinds of polymonochlorotrifluoroethylene having various degrees of crystallinity were studied over a frequency range 0.1 to 10^6 cycles/sec. and a temperature range of −50 to 140 C. ***Tatsuji Nakajima and Shogo Saito.*** *Journal of Polymer Science*, v. 31, Sept. 1958, p. 423-437.

1100* Infrared Spectra of High Polymers. VII. Polyacrylonitrile. The spectrum was obtained in the extended region of 70 to 3200 $cm.^{-1}$. Polarized measurements were made on stretched and rolled specimens in the range of 350 to 3200 $cm.^{-1}$. ***C. Y. Liang and S. Krimm.*** *Journal of Polymer Science*, v. 31, Sept. 1958, p. 513-522.

1101* Adhesive Strength, Heat of Wetting and Surface Activity of Carboxyl Substituted Polystyrene. The tear resistance of small Al blocks cemented with polystyrene increases from 120 kg cm^2 to about 360 kg cm^2, if about 0.5 wt. % of various carbolic acids is introduced by polymerization, probably because of the formation of H-bonds. (*In German.*) Über die Haftfestigkeit, Benetzungswärme und Oberflächenaktivität carboxylsubstituierter Polystyrole. ***E. Jenckel and H. Huhn.*** *Kolloid-Zeitschrift*, v. 159, no. 2, Aug. 1958, p. 118-129.

1102* Properties of Foamy Cold-Hardening Urea Formaldehyde Resins. II. The determination of properties in "isofoam", an insulating material for construction; flammability, sound absorption, and permeability to radioactive rays are considered. (*In German.*) Eigenschafter geschäumter kalthärtender Harnstoff-Formaldehydharze. II. ***H. Baumann.*** *Kunststoffe*, v. 48, Sept. 1958, p. 406-408.

1103 How to Design for Low-Pressure Molding. Gives data on process advantages, tooling costs, design considerations, machining reinforced plastics, and finishing. ***James C. Roller.*** *Machine Design*, v. 30, Oct. 2, 1958, p. 113-116.

1104* Investigation of Cured Polyester Resins. I. Constitution and Structure of Cured Polyester Resins. Cured polyester resins from unsaturated polyesters and styrene were degraded by aminolytic, hydrazinolytic, and hydrolytic reactions. Composition of polymeric degradation products and yields of polymerized monomer units were quantitatively determined. Simple relations exist between composition of unsaturated polyester resins of styrene and fumaric units and composition, as well as yields, of polymeric degradation products. These relations could be connected with network formation occurring on curing polyester resins. (*In German.*) Untersuchungen über gehärtete Polyesterharze. I. Zusammensetzung und Aufbau gehärteter Polyesterharze. ***Werner Funke, Werner Gebhardt, Heinz Roth, and Karl Hamann.*** *Makromolekulare Chemie*, v. 28, no. 1, Sept. 1958, p. 17-57.

1105* The Stereospecific Polymerization of Styrene With Organosodium Compounds. Preparation of crystallizable polystyrenes under low temperatures. (*In German.*) Über die stereospezifische Polymerisation von Styrol mit natriumorganischen Verbindungen. ***Werner Kern, Dietrich Braun, and Martin Herner.*** *Makromolekulare Chemie*, v. 28, no. 1, Sept. 1958, p. 66-71.

1106 Properties of Materials, Plastics and Rubber. Physical, mechanical, electrical, and fabricating properties, heat resistance, and uses are given for 28 different plastics and rubbers. *Materials in Design Engineering*, v. 48, Mid-Oct. 1958, p. 141-181.

1107 Continuous Forming of Fibrous Mat. A new process for forming mats, with or without fillers, resins, and other additives, is used for making the cores of high-pressure decorative laminates. ***Peter E. Fuerst.*** *Modern Plastics*, v. 36, no. 2, Oct. 1958, p. 115 + 5 pages.

1108 Fluidized Polymer Deposition. Equipment and techniques for applying such coatings over metallic substrates are described. ***Robert L. Checkel.*** *Modern Plastics*, v. 36, no. 2, Oct. 1958, p. 125 + 4 pages.

1109 Effect of Small Quantities of Plasticizers in PVC Compounds. Few room temperature changes are shown but small quantities of plasticizers actually increase rigidity and brittleness at low temperatures. ***P. Ghersa.*** *Modern Plastics*, v. 36, no. 2, Oct. 1958, p. 135 + 5 pages.

1110 High Polymers. Summarizes transactions at the International Conference on High Polymers at the University of Nottingham during July 21-24. ***C. E. H. Bawn.*** *Nature*, v. 182, Sept. 20, 1958, p. 772-774.

1111* Testing of Molded Styrene for Packaging Applications. Discusses permeability, chemical resistance, and shock resistance tests necessary for this plastic when it is being considered for a specific application. Four experiments, using general purpose and rubber-modified types of styrene, are described. ***Bennett Nathanson.*** *Package Engineering*, v. 3, Oct. 1958, p. 54 + 4 pages.

1112* How Primers and Coatings Improve Polyethylene Bond Adhesion. Trend to thinner gages, and variety of new combinations such as poly/saran are benefits made possible by

primers and coatings. ***Sam Gold.*** *Paper, Film and Foil Converter*, v. 32, Oct. 1958, p. 34-36.

1113 The Electron Microscopy of High Polymers. Describes the principles of electron microscopic examination of high polymers in order to provide the high polymer technologist with some idea of the scope of application of this method of investigation and of the difficulties in the method which are peculiar to high polymers. ***N. H. Langton and Margot Stephens.*** *Plastics (London)*, v. 23, Oct. 1958, p. 384 + 3 pages.

1114* New Wood Filled Urea Molding Compound. Roughly equivalent to phenolic in price, the new wood-filled urea molding compound surpasses it in color-fastness and arc resistance. It is also said to cause less mold wear and to produce moldings which are more scratch-resistant. *Plastics Industry*, v. 16, Oct. 1958, p. 28-29.

1115* New High Strength Molding Material. New molding compound possesses very high glass content and is available in a large variety of resin systems. Standard molding techniques can be employed. ***Sam G. Salzinger and Henry M. Toellner.*** *Plastics Industry*, v. 16, Oct. 1958, p. 32-35.

1116 Three New Tough, Rigid Thermoplastics: a Comparison. DuPont's Delrin acetal resin, General Electric's Lexan polycarbonate resin, and two polypropylenes—Hercules Powder's Pro-fax and Montecatini's Moplen are evaluated from a design engineer's standpoint. The most recent data on all three resins were examined and pulled together wherever valid comparison of properties was possible. ***Ford R. Park.*** *Product Engineering*, v. 29, no. 40, Sept. 29, 1958, p. 36-41.

1117* Reinforcing Epoxy With Metal Fiber. II. New compositions for tool and dies offer unlimited variations in the field of metal-fiber reinforcing. Some commercial case histories are reported. ***A. P. Mazzucchelli.*** *SPE Journal*, v. 14, Oct. 1958, p. 37-41.

1118* Perfluorocarbon Resin. Teflon 100X has a low melt viscosity, excellent dielectric characteristics over a wide range of temperatures and frequencies, heat resistance, toughness, chemical inertness, essentially no moisture absorption, and outstanding weather resistance. ***R. S. Mallouk and W. B. Thompson.*** *SPE Journal*, v. 14, Oct. 1958, p. 42-46.

1119* How to Machine Glass Base Laminated Plastic. ***E. C. Graesser.*** *Tooling & Production*, v. 24, no. 7, Oct. 1958, p. 56-58.

1120 Vinyl Resins. Surveys the applications of vinyl resins against background information on their types, properties, chemistry, manufacture, and fabrication. Every attempt is made to cover all recent advances in the vinyl field. ***W. Mayo Smith.*** 282 pp. 1958. Reinhold Publishing Corp., New York. (TP986.V4 Sm68v)

1121* The Thermal Embrittlement of Stressed Polyethylene. Experiments indicate that brittle failure is initiated in thermal embrittlement, environmental stress-cracking, and oxidation of polyethylene by different mechanisms. The experiments undertaken in this study were designed to differentiate among these proposed mechanisms. ***J. H. Heiss and V. L. Lanza.*** *Wire and Wire Products*, v. 33, Oct. 1958, p. 1182-1187.

1122* Wire Insulation of "Teflon"(R) FEP-Fluorocarbon Resin—Properties and Fabrication. "Teflon" 100X FEP-fluorocarbon resin is a new melt processable high temperature polymer which makes possible long continuous smooth lengths of tough jacketing for cables capable of continuous service at 200 C and which are weather-resistant, chemically resistant, and non-flammable. ***Robert S. Lovett and Robert E. Stabler.*** *Wire and Wire Products*, v. 33, Oct. 1958, p. 1192 + 5 pages.

1123* Thermodynamic Studies of Copolymer Solutions. III. Saponified Polyvinyl Acetates. The isotherms of acetone sorption by saponified polyvinylacetates and the heats of solution and of swelling of the latter in acetone were determined. With growth of the number of hydroxyl groups in the chain, the partial entropy of acetone decreases, the heat of solution becomes more negative, and the sorption capacity of the polymer falls sharply. (*In Russian.*) Termodinamicheskie issledovaniia rastvorov sopolimerov. III. Omylennye polivinilatsetaty. ***A. A. Tager and M. M. Iovleva.*** *Zhurnal Fizicheskoi Khimii*, v. 32, no. 8, Aug. 1958, p. 1774-1778.

1124* Investigation of Some Properties of Gamma-Irradiated Polyethylene. Results of studies of infrared spectra, radiograms, mechanical and dielectric losses of polyethylene subjected to cobalt^{60} γ-irradiation. (*In Russian.*) Issledovanie nekotorykh svoĭstv polietilena, podvergnutogo vozdeĭstviiu γ-izlucheniia. ***B. I. Sazhin, et al.*** *Zhurnal Tekhnicheskoi Fiziki*, v. 28, no. 9, Sept. 1958, p. 1991-1998.

See also: **694** (frictional properties of TFE); **1146** (deterioration of nylon fabrics); **1171** (welding of plastics).

POLLUTION AND WASTES

1125 Photochemical Secondary Reactions in Urban Air. Reactions considered include those in which the reactant concentrations are indirectly or directly dependent on light absorption. Existing information regarding products, mechanism, and rate of reaction is reviewed for each reaction and a small number of reactions are indicated to be of definite or possible significance. Most susceptible are those of oxygen atoms with molecular oxygen to form ozone, of ozone with nitric oxide and with olefins, and of free radicals with oxygen, nitric oxide, and olefins for it is shown that a mechanism based on these reactions is capable of producing the observed diurnal variations in ozone concentration in the air. Concludes that removal of aldehydes alone might appreciably retard smog formation in urban air. ***Philip A. Leighton and William A. Perkins.*** *Air Pollution Foundation, Report No.* 24, Aug. 1958, 212 pp. (TD884 Ai71.3r Vis.)

1126* Air Pollution Problems in Petroleum Refining. ***Frank J. Ells.*** *American Industrial Hygiene Association Journal*, v. 19, no. 4, Aug. 1958, p. 313-316.

1127* Industrial Air Pollution. Reviews the history and evolution of the modern day air pollution problem. ***William A. Christy.*** *Industrial Wastes*, v. 3, no. 5, Sept.-Oct. 1958, p. 107-111.

1128* Meteorological Aspects of Air Pollution. ***K. H. Jehn.*** *Industrial Wastes*, v. 3, no. 5, Sept.-Oct. 1958, p. D-11-D13.

1129* Atomic Energy Waste Disposal. Gaseous and airborne wastes, solid wastes, and liquid wastes are considered for ground disposal and ocean disposal. High level wastes are also studied. ***Conrad P. Straub.*** *Industrial Wastes*, v. 3, no. 5, Sept.-Oct. 1958, p. D24 + 8 pages.

1130* Platinum Oxidation Catalysts in the Control of Air Pollution. Catalytic combustion is a means of controlling or eliminating unpleasant fumes from industrial processes. This article demonstrates the versatility of the method with examples. ***J. H. Houdry and C. T. Hayes.*** *Platinum Metals Review*, v. 2, no. 4, Oct. 1958, p. 110-116.

1131 Radioactivity of People and Milk: 1957. Measurements of 2200 Samples for Cesium-137 and Potassium-40 Levels Reveal Interesting Correlations. Little change in the cesium-137 concentration in people was observed from 1956 to 1957, in spite of the increase in both the rate and the integrated levels of fallout. Precipitation is shown to be an important factor determining the cesium content of milk. ***Ernest C. Anderson.*** *Science*, v. 128, Oct. 17, 1958, p. 882-886.

1132* An Evaluation of Stabilization Pond Literature. Data in Germany, as well as some from Australia and the United States, indicate that the use of ponds for sewage purification is a practical procedure where the proper physical environment allows for such construction. ***George P. Fitzgerald and Gerard A. Rohlich.*** *Sewage and Industrial Wastes*, v. 30, Oct. 1958, p. 1213-1224.

1133* Slime Infestation — Literature Review. Conditions influencing the abundance of *Sphaerotilus* and *Leptomitus* in polluted streams. ***M. E. Harrison and H. Heukelekian.*** *Sewage and Industrial Wastes*, v. 30, Oct. 1958, p. 1278-1302.

1134* Investigations of Health Hazard in Connection With the Use of Organic Mercury Compounds in Paper Mills and Groundwood Mills. The concentration of Hg was determined in the air of mills which used organic Hg compounds as preservative and slimicide. Methyl mercuric compounds and phenyl mercuric acetate give approximately the same concentration of Hg in the air. (*In Swedish.*) Yrkeshygieniska undersökningar i samband med användande av organiska kvicksilverföreningar inom pappersbruk och exportsliperier. ***S. Freyschuss, O. Lindström, K.-D. Lundgren, and A. Swensson.*** *Svensk Papperstidning*, v. 61, no. 18, Sept. 30, 1958, p. 568-580.

1135 Environmental Contamination From Weapon Tests. Parts 1 and 2 of this report present data pertinent to the monitoring of long-range fallout, particularly Sr^{90} and Cs^{137}. Values are tabulated for the fallout deposition, air concentrations, water concentrations, and the amounts in foods and human bone. In addition, results are given for some experimental investigations. Part 3 presents bibliographies covering the period since the 1957 hearings before the Joint Committee on Atomic Energy concerning the nature of radioactive fallout and its effects on man. *U. S. Atomic Energy Commission, HASL-42*, Oct. 1958, 359 pp. (UF767 Un3.1ha Contin.)

See also: **149** (detergents in water supplies); **567** (air pollution control).

RUBBER AND ELASTOMERS

1136 *cis*-1,4-Polyisoprene Prepared With Alkyl Aluminum and Titanium Tetrachloride. By adjustment of the relative amounts of the two components of the catalyst and the temperature of polymerization, *cis*-1,4-polyisoprene can be produced free from *trans*-1,4 configuration. ***H. E. Adams, R. S. Stearns, W. A. Smith, and J. L. Binder.*** *Industrial and Engineering Chemistry*, v. 50, Oct. 1958, p. 1507-1510.

1137* Fluorocarbon Rubbers for High Temperature Service. Evaluates KEL-F Elastomers 5500, 3700, and 214. ***J. C. Montermoso, C. B. Griffis, Angus Wilson, and J. F. Oesterling.*** *Institution of the Rubber Industry, Proceedings*, v. 5, no. 4, Aug. 1958, p. 97-104.

1138* The Relationship Between Crosslinking and Degradation in Natural Rubber. Oxidation reactions, as followed by infrared spectrometry, may serve as a measure for judging the relative extent of oxidative degradation and crosslinking of two independent parallel reactions subsequent to the primary destruction. Such information can be derived from a kinetic analysis of the processes taking place in the rubber as a result of the absorption of energy. (*In German.*) Über Zusammenhange zwischen dem Vernetzungsgrad und der Degradation von Naturkautschuk. ***A. Tkáč and V. Kellö.*** *Journal of Polymer Science*, v. 31, Sept. 1958, p. 291-300.

1139* Rupture of Rubber. V. Cut Growth in Natural Rubber Vulcanizates. Cut growth in natural rubber gum vulcanizates was studied using both steady and repeated loading. ***A. G. Thomas.*** *Journal of Polymer Science*, v. 31, Sept. 1958, p. 467-480.

1140* Thermal Degradation of Polyacrylonitrile Polybutadiene, and Copolymers of Butadiene With Acrylonitrile and Styrene. Polybutadiene and a copolymer consisting of 76.5% butadiene and 23.5% styrene were investigated as to the rates of their thermal degradation. Polyacrylonitrile and a copolymer consisting of 31% acrylonitrile and 69% butadiene were investigated with regard to the nature and distribution of volatile products, as well as to the rates of their thermal degradation. ***Sidney Straus and Samuel L. Madorsky.*** *Journal of Resarch, National Bureau of Standards*, v. 61, no. 2, Aug. 1958, p. 77-81.

1141* Effect of Certain Heterocyclic Disulfides as Agents and Accelerators of Vulcanization. Effect of disulfides containing >N-S-S-N< in the molecule, such as N,N'-dithiodimorpholine(DTM). (*In Russian.*) O deĭstvii nekotorykh geterotsiklicheskikh disul'fidov kak agentov i uskoriteleĭ vulkanizatsii. ***B. A. Dogadkin, M. S. Fel'dshtein, I. I. Eitingon, and D. M. Perzner.*** *Kauchuk i Rezina*, v. 17, no. 9, Sept. 1958, p. 7-12.

1142* Effect of Changes in the Intermolecular Reaction on the Dynamic Fatigue of Rubber. Investigation of vulcanized rubbers varying in chemical composition and structure: natural, butadiene styrene-, and butadiene nitrile-rubbers. As solvents, dimethylphthalate, dibutylphthalate, dioctylphthalate, dibutylsebacinate, dioctylcebacinate, and petrolatum were studied. (*In Russian.*) Vliianie izmeneniia mezhmolekuliarnogo vzaimodeĭstviia na dinamiceheskuiu ustalost' rezin. ***V. E. Gul', D. L. Fediukin, and B. A. Dogadkin.*** *Kauchuk i Rezina*, v. 17, no. 9, Sept. 1958, p. 16-20.

1143 The Physics of Rubber Elasticity. The main object of this book (first published in 1949) is to present the statistical theory of rubber elasticity in a form in which its underlying physical concepts may be readily grasped, and to show how this theory provides a natural interpretation of the main physical phenomena associated with rubber-like materials. The present edition includes a chapter on the phenomena of swelling, and other new material, particularly in connection with crystallization and photo-elastic properties. ***L. R. G. Treloar.*** 2nd Ed. 342 pp. 1958. Oxford University Press, London. (QC191 T71p2)

1144* Compression Set of Silicone Rubber. Effects of silica fillers, vulcanizing agents, and other additives on the compression set. ***C. W. Roush and S. A. Braley, Jr.*** *Rubber Age*, v. 84, no. 1, Oct. 1958, p. 75-83.

1145* Application of Volatile Organic Liquids for Expanding Flexible Urethane Foam. Advantages are: a wide range of compression load can be obtained without changing the resin, very low density foams can be prepared more easily than with other methods, and the exotherm produced by the foaming reaction can be reduced. ***Ernst Klesper.*** *Rubber Age*, v. 84, no. 1, Oct. 1958, p. 84-87.

1146* Deterioration of Neoprene-Coated Nylon Fabrics. A study of the minimum neoprene thickness necessary to protect nylon from weather and sunlight. ***Clifford M. Brown.*** *Rubber Age*, v. 84, no. 1, Oct. 1958, p. 91-98.

1147 *cis*-Polybutadiene-Natural Rubber Blends. Preparation is shown to be feasible on a laboratory scale. Blends of this type have displayed hysteresis properties equivalent to the natural rubber control and have exhibited satisfactory modulus, tensile and Shore hardness in the recipes developed. ***H. E. Railsback, W. T. Cooper, and N. A. Stumpe.*** *Rubber and Plastics Age*, v. 39, Oct. 1958, p. 867 + 5 pages.

1148* Effect of Swelling on the Properties of Elastomers. A method is described for determining the change in certain physical properties of a rubber compound immersed in liquids. The method is based on equations relating the losses in physical properties to swell in liquids. ***Angus Wilson, C. B. Griffis, and J. C. Montermoso.*** *Rubber World*, v. 139, no. 1, Oct. 1958, p. 68-73.

1149* The Dispersion of Carbon Black in Rubber and Its Role in Vulcanizate Properties. II. Techniques for investigating the dispersion of carbon black in rubber compounds at magnifications from 40 to 25,000 are described. The role of various processing and compounding factors in the control of dispersion was investigated. Correlation of state of dispersion to vulcanizate properties reveals the most striking effect of improved dispersion to be enhanced tensile properties. ***C. W. Sweitzer, W. M. Hess, and J. E. Callan.*** *Rubber World*, v. 139, no. 1, Oct. 1958, p. 74-81.

See also: **203** (analysis of rubber stocks); **249** (synthesis of elastomers); **1106** (properties of rubbers).

SPACE HEATING AND CONDITIONING

1150 Flow of Heat in a Room With Fire and Chimney. An approach to the warming of a room by an open fire is provided by one specific instance of the problem. ***T. Ferguson.*** *Engineering*, v. 186, Oct. 3, 1958, p. 454-456.

1151 Noise—A Problem of Physical and Human Engineering. This problem depends on both intensity and frequency. By comparing established criteria for human tolerances and reaction with an analysis of the noise problem, it is possible to determine how much noise reduction is required. ***Richard D. Lemmerman and Richard R. Audette.*** *Iron and Steel Engineer*, v. 35, Oct. 1958, p. 116-123.

1152* Control of Acoustics on the Shop Floor. A "do-it-yourself" scheme requiring only a sound level meter. *Modern Lithographer and Offset Printer*, v. 54, Sept. 1958, p. 30-32.

1153* Refrigeration Lubricants. Criteria, such as pour point, floc point, dielectric strength (as an indication of moisture content) and viscosity—are insufficient alone for adequate evaluation of a lubricant. ***R. T. Divers.*** *Refrigerating Engineering*, v. 66, Oct. 1958, p. 40 + 6 pages.

1154* The Ventilation of Gold Mines in South Africa. Achievements of the Past and Problems of Today. ***Michael Barcza.*** *South African Institute of Mining and Metallurgy, Journal*, v. 59, no. 1, Aug. 1958, p. 25-37.

TEXTILES, FIBERS, LEATHER, AND PAPER

1155* Termite Control Investigation. Describes a service test installation designed to secure data on the protection afforded against attack by termites to southern yellow pine, coast-type Douglas fir and red oak timbers by the nine commercial preservatives now generally used by the railroads. *American Railway Engineering Association Bulletin*, v. 60, no. 545, Sept.-Oct. 1958, p. 131-142.

1156* The Constituents of the Kino of *Eucalyptus maculata* Hook. Ellagic acid, *p*-hydroxycinnamic acid, naringenin, and a new flavanolone, aromadendrin 7-methyl ether, have been isolated. ***R. J. Gell, J. T. Pinhey, and E. Ritchie.*** *Australian Journal of Chemistry*, v. 2, no. 3, Aug. 1958, p. 372-375.

1157* Condensed Tannins. II. Biogenesis of Condensed Tannins Based on Leuco-Anthocyanins. Details are given of the isolation and characterization of a monomeric (-)-leucofisetinidin from the wood extractives of *Schinopsis quebracho-colorado*, and of the identification by chromatography of a monomeric leuco-robinetinidin and a leucofisetinidin in the fresh-bark extract of *Acacia mollissima* ('wattle' extract). ***D. G. Roux and S. R. Evelyn.*** *Biochemical Journal*, v. 70, no. 2, Oct. 1958, p. 344-349.

1158* Translocation of Cations to Seedlings of *Pinus virginiana* Through Mycorrhizal Mycelium. Relatively large amounts of sodium were absorbed from the external supply and transferred to the mycorrhizae through the fungus in 48 hours. From them the ions were readily translocated into the root and shoot tissues. ***Elias Melin, Harald Nilsson, and Edward Hacskaylo.*** *Botanical Gazette*, v. 119, no. 4, June 1958, p. 243-246.

1159 Studies of Lignin Biosynthesis Using Isotopic Carbon. VI. Formation of the Side Chain of the Phenylpropane Monomer. A number of aromatic compounds having carbon side chains of varying length and substitution have been studied as lignin precursors. Three monocotyledons tested could utilize (+)- and (−)-phenyllactic acid to a comparable degree, two dicotyledons showed a marked preference for the (−)-form, suggesting that in dicotyledons the enzyme system specific for the (−)-form is predominant. ***D. Wright, Stewart A. Brown, and A. C. Neish.*** *Canadian Journal of Biochemistry and Physiology*, v. 36, Oct. 1958, p. 1037-1045.

See also: **385** (control for wood chip digesters); **1098** (viscose rayon).

WELDING AND JOINING

1160* Welding Stainless Steels and H.T. Alloys. I. Discusses weldability of corrosion and heat resistant alloys. ***H. A. Skelton.*** *Canadian Metalworking*, v. 21, Oct. 1958, p. 48 + 6 pages.

1161* Want Better Spot Welding? Use Basic Data. Insight into the basic principles and true value of the spot welding process. ***H. Thomasson.*** *Canadian Metalworking*, v. 21, Oct. 1958, p. 64 + 1 page.

1162* How Stainless Piping Was Welded for an Atomic Sub. Techniques used to get "perfect" welds in stainless piping for the Navy's U.S.S. Tullibee. *Industry & Welding*, v. 31, Oct. 1958, p. 62 + 3 pages.

1163* Six Joints to Use When Welding Titanium. Good joint fit-up and correct welding procedures for high quality welds. *Industry & Welding*, v. 31, Oct. 1958, p. 68-70.

1164* An Engineer Explains Tungsten Inert Arc Welding. ***Frank Kuncz.*** *Industry & Welding*, v. 31, Oct. 1958, p. 71 + 3 pages.

1165* Cold-Working Relieves Weld Stress, Eliminates Metal Removal. A way to eliminate locked-up stresses from butt welds and make them flush with the base metal in one operation. ***H. L. Meredith.*** *Industry & Welding*, v. 31, Oct. 1958, p. 76 + 2 pages.

1166* New Power Source Broadens Use for CO_2 Welding. Automatic, all-position CO_2 welding can now be used with light gages and on heavier metal. ***H. J. Bichsel, E. J. Steinert, and E. R. Gamberg.*** *Iron Age*, v. 182, no. 17, Oct. 23, 1958, p. 61-63.

1167* Industrial Adhesives. The advantages and types of industrial adhesives are discussed. *Mechanical World and Engineering Record*, v. 138, Oct. 1958, p. 455-456.

1168* Quality Welds Join Missile Engine Frames. Ballistic missile welds are to unusually close dimensional control and high quality standards. ***George H. De Groat.*** *Metalworking Production*, v. 102, no. 41, Oct. 10, 1958, p. 1787-1788.

1169* A New Method for Proving the Existence of Internal Stresses Caused by Welding. Principles; experiments; influence of experimental conditions upon the result. (*In German.*) Eine neue Methodik zum Nachweis von Schweisseigenspannungen. ***W. Rädeker.*** *Schweissen und Schneiden*, v. 10, Sept. 1958, p. 351-358.

1170* Welding in the Equipment of the Marcoule Plutonium Plant. Plutonium extraction processes; operations, reagents temperatures and pressures. Bars of U-238 containing 0.7% of U-235 remain from 6 to 12 months in the pile. Fission of U-235; part of U-238 is transformed into Pu-239. (*In French.*) Le soudage dans l'équipement de l'usine de plutonium de Marcoule. ***P. Couturier.*** *Soudage et Techniques Connexes*, v. 12, nos. 7/8, July-Aug. 1958, p. 277-287.

1171* High-Frequency Welding of Plastics. Characteristic of special equipment and description of various welding units with high-frequency as power source. The new welding method facilitates automation of the process, improves working conditions, assures high strength and density of joints, etc. (*In Russian.*) Svarka plasticheskikh mass tokami vysokoĭ chastoty. ***S. E. Semiachkin and F. G. Trofimov.*** *Svarochnoe Proizvodstvo*, 1958, no. 9, Sept., p. 9-11.

1172* Resistance Butt Welding of Titanium and Its Alloys With Modernized Welding Units Type MSGA-300. Investigation of resistance butt welding of ring-shaped parts made of titanium and its alloys. Application of resistance welding instead of fusion welding increases quality of welded joints and sharply decreases time and labor consumption of operation. (*In Russian.*) Stykovaia svarka titana i ego splavov na modernizirovannykh mashinakh tipa MSGA-300. ***M. K. Zaburdin, V. F. Zakharenko, S. N. Shestakov, and F. E. Tret'iakov.*** *Svarochnoe Proizvodstvo*, 1958, no. 9, Sept., p. 36-39.

See also: **648** (stress in welded diaphragms of steam turbines); **844** (arc welding Inconel); **852** (welding Mg); **863** (welded wire mesh).